



JOURNAL OF ARMY MEDICAL COLLEGE CHATTOGRAM



ISSN 2663-778X

BMDC Approved

"Transforming Health Care through Research"

- Volume 4
- Issue 2
- December 2021

◆ Editorial

- Plagiarism in Research: An Ethical Offence□ 1
A A M R Uddin

◆ Original Articles

- Peripheral Blood Lymphocyte Count as an Early Predictor of The Severity of COVID-19 Infections□ 2
S M S Islam I B Chowdhury C K Roy

- Quality of Dietary Service in A Military Hospital□ 6
A S M Z Ali A B M B Hossain

- Angiographic Severity and Outcomes of ST Segment Elevation Myocardial Infarction in Association with Reciprocal ST Segment Depression□ 11□
M N H Sowdagar Z Jabbar R Ershad M A Haque S Hossain

- The Role of Metformin in Menstrual Regulation and Body Weight Reduction in Polycystic Ovary Syndrome□ 18
S Yasmin R Ershad J Begum

- Effects of Sildenafil on Six Minute Walk Distance and Pulmonary Hypertension Associated with Chronic Obstructive Pulmonary Disease : Randomized Control Trial□ 21
K M T Alam A S M Zahed M Saleheen J Abedin R S R Biswas

- Clinicohaematological Profile and Outcome of Falciparum Malaria in Hospitalized Children : A Prospective Study□ 26
D Barua T Barua R Talukder M Datta P K Barua J B Amin

◆ Case Reports

- Giant Cell Tumour of Dorsal Vertebra: A Case Report□ 32
N Akhter M Rahman A K M Iqbal S Waheed M Russell

- Infected Gap Nonunion of Humerus by Induced Membrane Formation in Masquelet's Technique : A Case Report□ 35
T E Kabir A K Biswas C Baidya A Azdar M R Hoque A Dey Q Uddin B K Das T K Nath

AN OFFICIAL JOURNAL OF
ARMY MEDICAL COLLEGE CHATTOGRAM
www.amcc.edu.bd/journal

Journal of Army Medical College Chattogram (JAMCC)

Editorial Board

- Chief Patron** : Major Gen Md Saiful Abedin, BSP, SGP, ndc, psc
- Editor-in-Chief** : Brig Gen Dr. Reza Ershad
- Executive Editor** : Professor Dr. Shaibal Barua
- Editorial Members** : Brig Gen Md Moklesur Rahman
Brig Gen Md Kabir Uddin
Col Ismat Ara
Professor Dr. Sanjoy Kumar Chakraborty
Professor Dr. S M Suhrawardy
Professor Dr. Mohammad Ikram Ullah Khan
Lt Col Md Iqbal Karim
Lt Col Afroza Begum
Dr. Saifun Nahar Faiz
Dr. Ahmad Sadek
- Assistant Editors** : Dr. Tamanna Binta Hasan
Dr. Prasun Barua
- Web Editor** : Md. Monirul Islam
- Correspondence** : Office of the Librarian
Army Medical College Chattogram
Chattogram Cantonment, Chattogram, Bangladesh
Mobile : +88 01871 03 84 25
E-mail: jamcc.bd@gmail.com
- Published by** : Brig Gen Dr. Reza Ershad
Principal
Army Medical College Chattogram
- Printed by** : New Computer Suporna
Chattogram
Cell : +88 01819 80 30 50
Email : abedulhuq@gmail.com
supornacomputer@yahoo.com

Journal of Army Medical College Chattogram (JAMCC), the official journal of Army Medical College Chattogram (AMCC) Bangladesh is published by the Editor-In-Chief of JAMCC. All Communication is to be addressed to the Editor-In-Chief of JAMCC. Copying any part of this journal in any modality needs written permission from the Editor-in-Chief. Editorial staffs are not responsible for the contents and the comments communicated through published articles.

"Plagiarism in Research: An Ethical Offence"

A A M Ryhan Uddin^{1*}

The term plagiarism is derived from Latin word 'Plagiarius' meaning kidnapper.

Plagiarism is the representation of another author's language, thoughts, ideas and expressions as one's own original work or research. Plagiarism is considered a violation of academic integrity and breach of journalistic ethics.

Plagiarism and copyrights are not synonymous, plagiarism refers to claiming of others work as self where as copyright infringements is the use of copyright protected materials without permission of copyright holder. By nature plagiarism is an ethical issue whereas copyright infringement is legal issue.

Plagiarism are several types :

- i) Character preserving or direct plagiarism : simply copy and paste of the original work
- ii) Semantic preserving or mosaic plagiarism: is haphazard borrowing, translation, piecemeal copy and paste without putting quotation or proper citation
- iii) Syntax preserving plagiarism: Is the synonymous substitution of original work
- iv) Idea preserving plagiarism : copying of the idea or reusing text structure
- v) Ghost writing : Is the writing in favour of the plagiarist by another author.

The act of plagiarism can be identified by thorough checking of the work and comparing with previous ones which is very difficult and time consuming. With the development of IT and internet, it has become easier to check plagiarism using the plagiarism checking software available both in free and on payment.

Generally though plagiarism is considered is hype, but specifically it is not mentioned in any current statutes either as criminal or civil. In consideration of moral values and for avoiding the act plagiarism, plagiarist are penalised or punished in different ways depending on the extent and type of plagiarism.

1. Senior Consultant
Professor of Internal Medicine & Intensive Care Unit
Evercare Hospital, Chattogram.

*Correspondence: **Dr. A A M Ryhan Uddin**
Cell: +88 01817 74 42 97
Email: ryhandr@yahoo.com

Submitted on : 20th November 2021
Accepted on : 5th December 2021

At the end though there is no mention in current statutes about plagiarism either as criminal or civil offence, it is unfair or fraud to claim others work as self without acknowledgement to the real owner. So, there should be the system of penalty or punishment for plagiarist depending on the nature and extent of plagiarism. Otherwise it would be an unfair means of acquisition of others achievement as self that hinder growth of intellectual properties.

Although the plagiarism is dominant in education research, journalism, culture and literature etc, the act of plagiarism is responsible for defamation and occasion penalties. So it should be avoided in intellectual practice as well.

References

1. Dhammi IK, Huq ULR. What is plagiarism and how to avoid it? Indian Orthop. 2016;50(6):581-583.
2. Debnath J. Plagiarism : A silent epidemic in scientific writing : Reasons, Recognition and Remedies. MedJ Armed Force India. 2016;72(2):164-167.
3. Khadikar SS. The Plague of Plagiarism : Prevention and Cure. J Obstet Gynecol India. 2018;68:425-431. doi.org/10.1007/s 13224-018-1182-9.
4. Krokosez M. Plagiarism in articles published in Journal Indexed in the Scientific Periodicals Analysis between 2013 and 2018. Int J Educ Integr. 2021;17:1. doi.org/10.1007/s 40979-020-00063-5.
5. Sharma H, Verma S. Insight into moderns day plagiarism: The Science of Pseudo Research. Tzu chiMed J. 2020;32(3):240-244. DOI : 10.4103/temj.temj-210-19.
6. Guy J. Curtis & Kell Tremayne. Is Plagiarism really on the rise? Result from four 5-yearly Surveys. Studies in Higher Education. 2021;46(9):1816-1826. DOI : 10.1080/03075079.2019. 1707792.
7. Hossain MA. Plagiarism in Research : A Curse. Institutional Research Symposium. Chattogram, Bangladesh. December 30;2021.

Peripheral Blood Lymphocyte Count as An Early Predictor of The Severity of COVID-19 Infections

Saleh Mohammad Shahedul Islam^{1*} Iqbal Bahar Chowdhury² Chandan Kumar Roy³

ABSTRACT

Background : Coronavirus Disease 2019 (COVID-19) is a new respiratory and systemic disease that needs quick identification of potential critical patients. This study aimed to explore the relationship between differential lymphocyte count and the severity of COVID-19.

Materials and methods : This prospective observational study was conducted on 130 COVID-19 patients at Combined Military Hospital, Bogura, Majhira Cantonment, Bangladesh during the time period of June 2020 to September 2020. Hospital admitted, RT-PCR positive for SARS-CoV-2 with history of exposure to corona positive cases were selected as the study cases with particular attention to clinically moderate and severe cases of COVID-19. Critically ill patients were excluded from the study.

Results : Out of 130 RT-PCR positive COVID-19 cases, 45(35%) patients were in the age group of 20-34 years with male female ratio 1.36:1. Fever was the most common symptom present in 86 (66%) of patients and hypertension was the most common comorbid condition present in 37(28.49%) cases. Twenty Four (32%) of total male and twelve (22%) of total female had differential lymphocyte count within 0-10% range, 28(77%) of them presented with severe COVID-19 pneumonia and 08 (22%) patients were presented with moderate COVID-19 pneumonia in this group. Fifteen (20%) of total male and twenty (36%) of total female had differential lymphocyte count within 11-20% range in this group, 20 (57%) patients presented with severe COVID-19 pneumonia and 15 (43%) presented with moderate COVID-19 pneumonia. Fifteen (15%) of total male and Nine (9%) of total female were in the range of >41% differential lymphocyte count, none of these patient presented as severe or moderate COVID-19 pneumonia. Out of 130 cases in the present study, total 71 patients had differential count of lymphocyte less than 20% and among them 48 (76%) patients presented with severe form of COVID-19 infection.

Conclusion : Lymphopenia is a prominent part of severe COVID-19 pneumonia, differential count of lymphocyte may be useful in predicting the severity of clinical outcomes with limited resources facility.

Key words: COVID-19 pneumonia; Differential count of lymphocytes; SARS CoV 2.

Introduction

On 31 December 2019, a cluster of pneumonia cases of unknown etiology was reported in Wuhan, Hubei Province, China has now spread worldwide and is characterized by the World Health Organization (WHO) as a pandemic.^{1,2,3} The (SARS-CoV-2) virus disease (COVID-19) shares similar epidemiological characteristics with the Severe Acute Respiratory Syndrome Corona Virus (SARS-CoV-1) and the Middle East Respiratory Syndrome Corona Virus (MERS-CoV). However, their mortality rate differs significantly as COVID-19 presents a lower mortality rate as compared with SARS-CoV-1 and MERS-CoV. Despite

this fact, the COVID-19 is more contagious.⁴ Regardless of difference noted, these diseases manifest similarly with a cough and fever.^{5,6} Laboratory findings, especially the Complete Blood Count (CBC) play an essential role to predict the severe infection and fatal outcome while dealing with this infectious disease. Various studies were performed to find out the relationship of differential count of lymphocyte in different parts of world and they found decrease differential count of lymphocyte is associated with severe infection in COVID-19. We also tried to find out the relationship of differential count of lymphocyte with the severity of COVID-19 infection.

We aim to report the CBC findings of this new viral disease, specially peripheral blood differential lymphocyte count, which may provide the useful information to physicians and help them to predict the clinical severity and fatal outcome of the disease and make the management plan of COVID-19 patients accordingly.

Materials and methods

This prospective observational study was conducted on 130 COVID-19 patients at Combined Military Hospital, Majhira Cantonment, Bogura, Bangladesh during the time period of June 2020 to September 2020. Hospital admitted, Nasopharyngeal swab RT-PCR positive patients for COVID-19 with

1. Col & Classified Medicine Specialist & Gastroenterologist
Combined Military Hospital, Bogura.
2. Col & Deputy Commendent
Combined Military Hospital, Bogura.
3. Associate Professor of Microbiology
Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka.

*Correspondence: **Dr. Saleh Mohammad Shahedul Islam**
Cell: +88 01715 28 77 56
Email: shahed_943@yahoo.com

Submitted on : 30th September 2021
Accepted on : 26th November 2021

history of exposure to virus was selected as study case with particular attention to clinically moderate and severe cases. Evidence of lungs involvement was detected by Chest X-Ray (CXR) and High Resolution Computed Tomography (HR-CT) scan of chest. Clinical examination was done after obtaining informed written consent from all study cases. Clinical findings, radiological and other laboratory investigations were recorded on designed data-sheet accordingly. Complete blood count and lymphocyte differential count of peripheral blood was obtained from all patients and correlated with the clinical condition and outcome. Patients with negative results for COVID-19 RT-PCR and patient presenting with very critical conditions were excluded from the present study. All procedures performed in the present study were in accordance with the ethical standard of the Local ethical committee and with the 1964 Helsinki Declaration and its later amendments. Results of CBC, C-Reactive protein, CXR P/A View and HR-CT scan of the chest of RT-PCR confirmed 130 COVID-19 patients were recorded and analyzed. Statistical analysis were done on Excel Version of Windows 10.

Results

Data of 130 cases of RT-PCR positive COVID-19 were analyzed. The median age of the study population was 42 years. Total 75 (57.69%) males and 55 (42.31%) females were enrolled in the study where highest number of patients were [45 (35%)] in the age group of 20-34 years, then 40 (31%) patients were in the age group of 35-49 years, 25 (19%) in the age group of 50-64 years, 20 (15%) in age group above 65 years, with 1.36:1 male-female gender ratio (Figure 1). Presenting symptoms were fever in 86 (66%) cases, shortness of breath in 50 (38%) cases, cough in 47 (36%) cases, diarrhea in 25 (19%) cases, anosmia in 9 (7%) cases, and others in 20 (15%) cases (Table II). Many patients were presented with multiple symptoms. Some patients were admitted with comorbidities like Hypertension : 37 (28.49%) cases, Diabetes Mellitus : 32 (24.62%) cases, Bronchial Asthma 21 (16.15%) cases, and Ischemic heart disease : 23 (17.69%) cases (Figure 2). Twenty four (32%) of total male (n=75) and 12 (22%) of total female had (n=55) differential lymphocyte count within 0-10%, 28(77%) of them presented with severe COVID-19 pneumonia and 8(22%) patients were presented with moderate COVID-19 pneumonia. Fifteen (20%) of total male and 20 (36%) of total female had differential lymphocyte count within 11-20% range. 20 (57%) patients presented with severe COVID-19 pneumonia and 15 (43%) presented with moderate COVID-19 pneumonia in this group. Fifteen of total male and 9 of total female were in the range of >41% differential lymphocyte count, none of the patient presented with severe or moderate COVID-19 pneumonia in this group. Out of 130 cases, in our study we found total 71 patients had differential count of lymphocyte less than 20% and among them, 48 (76%) patients presented with severe form of COVID-19 infection (Table I).

Table I Differential count of peripheral blood lymphocytes and severity in COVID-19 pneumonia

Sl. No.	Lymphocyte Count	Numbers	C-reactive Protein		X-Ray P/A view Covid-19 Pneumonia		HRCT Covid-19 Pneumonia		Clinical Stage		
			Positive	Negative	Yes	No	Positive	Negative	Mild	Moderate	Severe
1	0-10% (Male)	24	20	4	19	5	24	0	0	3	21
	0-10% (Female)	12	9	3	8	4	12	0	0	5	7
2	11-20% (Male)	15	15	0	15	0	15	0	0	8	7
	11-20% (Female)	20	18	2	19	1	20	0	0	7	13
3	21-30% (Male)	7	1	6	1	6	1	6	4	2	1
	21-30% (Female)	8	2	6	2	6	2	6	5	2	1
4	31-40% (Male)	14	1	13	1	13	1	13	13	1	0
	31-40% (Female)	10	2	8	1	9	1	9	9	1	0
5	>41% (Male)	15	2	13	0	15	0	15	15	0	0
	>41% (Female)	5	1	4	0	5	0	5	5	0	0
Total:		130	71	59	66	64	76	54	51	29	50

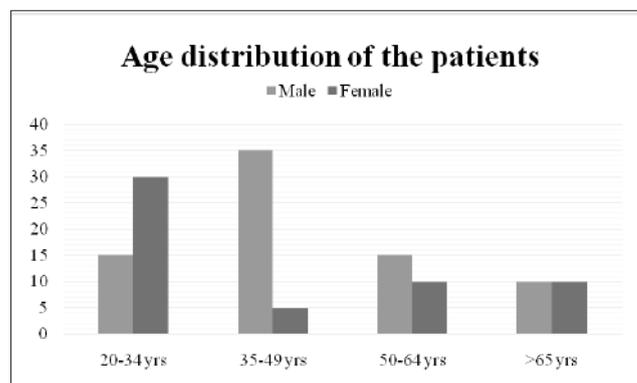


Figure 1 Age distribution of the COVID-19 patients

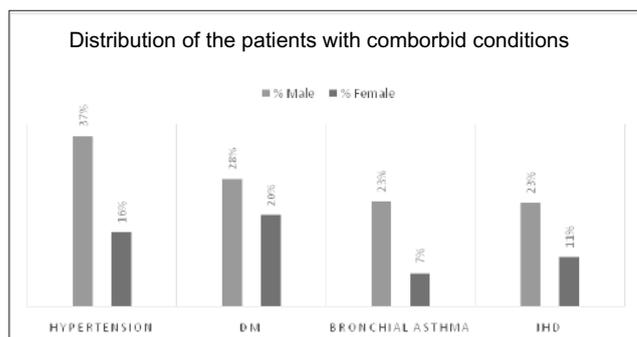


Figure 2 Comorbid conditions of the respondents

Table II Presenting complaints of the study population

Sl.No.	Symptoms	Frequency				Total
		Male	%	Female	%	
1	Fever	47	62.67%	39	70.91%	66.15%
2	Diarrhoea	17	22.67%	8	14.55%	19.23%
3	Cough	32	42.67%	15	27.27%	36.15%
4	Shortness of breath	31	41.33%	19	34.55%	38.46%
5	Anosmia	5	6.67%	4	7.27%	6.92%
6	Others	12	16.00%	8	14.55%	15.38%

Discussion

Lymphocytes play a decisive role in maintaining immune homeostasis and inflammatory response throughout the body. Understanding the mechanism a reduced blood lymphocyte level is expected to provide an effective strategy for the treatment of COVID-19. We speculated four potential mechanisms leading to lymphocyte deficiency.

i) The virus might directly infect lymphocytes, resulting in lymphocyte death. Lymphocytes express the coronavirus receptor ACE2 and may be a direct target of viruses.⁷

ii) The virus might directly destroy lymphatic organs. Acute lymphocyte decline might be related to lymphocytic dysfunction and the direct damage of novel coronavirus virus to organs such as thymus and spleen cannot be ruled out. This hypothesis needs to be confirmed by pathological dissection in the future.

iii) Inflammatory cytokines continued to be disordered, perhaps leading to lymphocyte apoptosis. Basic researches confirmed that Tumour Necrosis Factor- α (TNF- α) interleukin (IL)-6 and other pro-inflammatory cytokines could induce lymphocyte deficiency.⁸

iv) Inhibition of lymphocytes by metabolic molecules produced by metabolic disorders, such as hyperlactacidemia. The severe type of COVID-19 patients had elevated blood lactic acid levels, which might suppress the proliferation of lymphocytes.⁸

Multiple mechanisms mentioned above or beyond might work together to cause lymphopenia, further research is needed to confirm this.

Chen et al analyzed 29 patients with COVID-19 and found 20 patients of severe infection were associated with (n=20/29) lymphocytopenia.⁹ Jing Liu et al found 13 severe cases of COVID-19 infection is associated with significant and sustained decrease of lymphocyte count out of 40 admitted cases.¹⁰ Wung et al (n=138) also found persistent lymphocytopenia until death.¹¹ Huang et. al., (n=41) also reported CBC abnormality such as lymphopenia (63%) in severe CoVID-19 infection.¹² Li et al have recently shown in one-single arm meta-analysis of 1994 patients and revealed lymphocytopenia (64.5%) in severe cases.¹³ Laboratory data analysis of 452 patients by Qin et al showed patients with higher leukocytes count and lower percentages of monocytes, basophils, and eosinophils, as well as lymphocytopenia in the more severe cases.¹⁴

In most of the study discussed above revealed that lymphocytopenia is associated with the severity of COVID-19 infection and percentage is around 65% which correlates with our study (67%). There is also some variation with few studies which may be due to variation of enrollment of severe cases and ethnic difference and strain of the virus in that particular area. We report the CBC findings of this new viral disease, specially peripheral blood

lymphocyte count, may provide the useful information to physicians and help them to predict the clinical severity and fatal outcome of the disease and to make the management plan of COVID-19 patients accordingly.

Conclusion

This study suggested that peripheral blood lymphocyte differential count below 20% can be used as a reliable indicator to classify the severity of COVID-19 infection and clinician can early predict the severity and plan treatment accordingly.

Recommendation

Further studies are needed to focus on lymphocyte changes in COVID-19 to confirm the predictive ability of lymphopenia in COVID-19.

Disclosure

All the authors declared no competing interests.

References

1. Mahase E. Covid-19. WHO declares pandemic because of "alarming levels" of spread, severity and inaction. *BMJ*. 2020; 368. www.m1036.10.1136/bmj.m1036.
2. World Health Organization Coronavirus. 2019.
3. World Health Organization Novel Coronavirus (2019-nCoV) situation reports. 2019.
4. Meo S.A et al. Novel coronavirus 2019-nCoV: Prevalence, biological and clinical characteristics comparison with SARS-CoV and MERS-CoV. *Eur. Rev. Med. Pharmacol. Sci.* 2020; 24.
5. Zhang J et al. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. *Allergy*. 2020. DOI: 10.1111/all.14238
6. Xu X et al. Imaging and clinical features of patients with 2019 novel coronavirus SARS-CoV-2. *Eur. J. Nucl. Med. Mol. Imaging*. 2020. DOI : 10.1007/s00259-020-04735-9.
7. Xu, H et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. *Int J. Oral. Sci.* 2020; 12(8).
8. Liao, Y. C et al. IL-19 induces production of IL-6 and TNF-alpha and results in cell apoptosis through TNF-alpha. *J. Immunol.* 2002; 169, 4288–4297.
9. Chen L et al. Analysis of clinical features of 29 patients with 2019 novel coronavirus pneumonia. *ZhonghuaJie He He Hu Xi ZaZhi*. 2020;43:203–208.
10. Jing Liu et al. Longitudinal characteristics of lymphocyte response and cytokines profiles in the peripheral blood of SARS CoV -2 infection. www.elsevier.com/locate/ebiomedicine. 2020; 55(2020) 102763.

11. Wung D et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. *JAMA*. 2020;323: 1061–1069.
DOI : 10.1001/jama.2020.1585.

12. Huang C et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*. 2020; 395:497–506.
DOI : 15 10.1016/S0140-6736(20)30183-5.

13. Li L.-Q et al. 2019 novel coronavirus patients' clinical characteristics, discharge rate and fatality rate of meta-analysis. *J. Med. Virol.* 2020.
DOI : 10.1002/jmv.25757.

14. Qin C et al. Dysregulation of immune response in patients with COVID-19 in Wuhan, China. *Clin. Infect.* 2020.
DOI : 10.1093/cid/ciaa248.

Quality of Dietary Service in A Military Hospital

A S M Zulfiquer Ali^{1*} A B M Belayet Hossain²

ABSTRACT

Background: Good food is important in the treatment of the patient and is a part of his total care. If food offered has variety, well prepared, and attractively served, the patient will leave the hospital with an agreeable impression of his care during the hospitalization. To assess the quality of dietary service and determine its level of satisfaction in Combined military hospital, Rangpur.

Materials and methods : This descriptive type of cross-sectional study was conducted among admitted patients of Combined Military Hospital, Rangpur from July 2018 to December 2018. A total of 113 cases were selected through purposive sampling .Data were collected by face to face interview using Acute Care Hospital Foodservice Patient Satisfaction Questionnaire (ACHFPSQ) and checklist. Data were analyzed by SPSS version 23.0 .The data was presented in the form of frequency and percentage and appropriate statistical analyses were done, $p < 0.05$ considered as significant.

Results: The mean age of the respondent was 43.19 ± 11.19 years. Among all 113 respondents 61.1% were male and 38.9% were female, 99.1% were Muslim, 92.9% were married, 62.8% were SSC qualified, 7.1% illiterate, 38.1% were housewives. Regarding quality of food, scored 80.5% good, 8.0% bad; Physical environment 92.0% good and 8.0% bad; Meal size 62.0% were very good and 15.9% were good. Overall foodservice satisfaction 10.6% were very good, 83.2% were good and 6.2% were bad.

Conclusion: Good food service is not only necessary for physiological and therapeutic needs of the patient but is also one of the most important public relations measure. Efficient management and supervision are basic in good food production.

Key words: Dietary service; Military hospital; Quality.

Introduction

Food eating well is important for everyone's health and wellbeing. The purpose of food service department in every hospital is the preparation of nutritionally adequate, attractive meals at a cost consistent with the policies of the institution. Today, the dietary department ranks as one of the major departments of the hospital headed by a specialist, the dietician.¹ Food is not only necessary to meet an individual's nutritional requirements; it also needs to be appropriate for different age groups, religious, cultural and social backgrounds, as well as for different medical conditions. Food provided needs to be familiar, tasty and available. Above all, it needs to be eaten and enjoyed. Maximizing opportunities for individuals to eat and drink and maximizing quality and choice of food and fluids offered are considered to be fundamental to improving intakes².

Providing appropriate nutrition in the hospital setting is a particularly challenging task due to the diverse dietary needs of those who are unwell. The hospital nutrition service is a combination of two aspects, that is, nutrition and dietetics. Nutrition is the combination of processes by which the living organism receives and utilizes the material necessary for the maintenance of its function and for the growth and renewal of its components. Dietetics has been defined as the application of the science and art of human nutrition in helping people select and obtain food for the primary purpose of nourishing their bodies in health or disease throughout the life cycle. It is quite natural that nutritional care is based on the nature and character of diseases and therefore this needs to follow an individualistic approach.³ Hospital management in modern era has become patient centered and patient satisfaction can only be achieved through a combined mechanism of clinical quality and service quality. The challenges faced by hospital food services are multi-faceted due to the wide range of dietary needs of the patients. Dietary needs vary based on age, religious and cultural practices and medical problems. Health care institutions in a competitive environment are seeking novel approaches to meet these challenges through constant upgrading of their meal distribution services.⁴ Diet is compulsory for all inpatient. Proper diet is the key to good health and helps patients in the hospital to get well soon.

The objective of the dietary services is to make provision for clean, hygienic and nutritious diet for the indoor patient

1. Assistant Director of Medical Services (ADMS)
10, Infantry Division
Ramu Cantonment, Cox's Bazar.

2. Lt Col & Commanding Officer
10 Field Ambulance
Rangpur Cantonment, Rangpur.

*Correspondence: **Colonel (Dr) A S M Zulfiquer Ali**
Cell: +88 01711 46 33 03
Email: zulfiquer19@gmail.com

Submitted on : 2nd November 2021
Accepted on : 18th December 2021

as per their caloric requirement. The dietary service can be providing either by in house provision or by out sourcing. Dietary guidelines are set of advisory statements providing principles and criteria of good dietary practices to promote national wellbeing.⁵ Patient satisfaction has become a key criterion by which the quality of health care services is evaluated. When looking at overall hospital patient satisfaction, foodservice satisfaction may sometimes go unnoticed, as nursing and physician quality and the quality of technical medical care are more commonly identified in the research. However, the need to assess the food services in a hospital is not only important for patients welfare and nutrition but also for financial reasons.⁶ Patient care is best provided with the co-ordinated efforts of the health care team, involving dietitians, physicians, nurses and employees of the food service unit as well, with the patient as a partner and the central receiver of all professional care. Maintenance of comfort and quality of life are the well-established goals of nutritional care for the patients.⁷

The health industry as becoming more competitive and patients are becoming more discriminating about quality, the health care has redefined patient, recognizing them as customer.⁸ With rising competition in health care industry, improvement of hospital catering could be one aspect in improving patient satisfaction on overall hospital stay. Food and nutritional care quality in a hospital must be evaluated and deemed fit to enhance the efficacy of its services. Hospital food standard can form a part of the overall service quality standard along with other supportive services. This requires development of guidelines and qualification and assessment of food services on a regular basis.⁴ Patient perspectives about level of care can result in feedback which is helpful for promoting higher quality standard of patient care.⁵ Promoting optimal nutritional status through quality hospital foodservices can lead to a faster recovery and decreased length of hospital stay which can have a larger impact on hospital cost.⁹ Dietary services in the hospital are responsible for providing safe, clean, optimum nutrition in a scientific and sanitary way with minimum cost at right time and right place to right person.

Hospital food and nutrition administrators are challenged to consistently evaluate ways to reduce food costs and also maintain food quality. With the increasing competition in health care service, many hospital foodservice operations are looking for ways to improve patient satisfaction.⁹ So this is a very important issue that has gained increase attention in recent years. Improper management of hospital dietary service can causes serious consequences like risk for chronic diseases, increase average length of hospital stay, wastage of money, which ultimately put bad impacts on hospital image to the mass population. Assessing the quality of dietary service of hospital, easily can find out the problems and overcome the problem by improving quality of care.

Materials and methods

This descriptive cross-sectional study was conducted in inpatient department of Combined Military Hospital, Rangpur from July 2018 to December 2018. A total of 113 cases were selected through purposive sampling. Data were collected by face to face interview with structured questionnaire. The interview was conducted minimum three days after admission of the patient. Confidentiality was duly ensured to all participants and informed consent was obtained. Institutional permission from the appropriate authority was obtained before starting the study. After collection data were scrutinized, edited and verified for its consistency. Data were processed and analyzed by computer software SPSS version 23 and Chi-square test was done for any association.

Results

This study revealed that the mean age of the patient was 43.19± 11.19 years and ranged from 19-78 years among them highest 44.2% patients were 19-38 years age group. Male were 61.1% and female 38.9%. Majority of the respondents were Muslim (99.1%), Married 92.9%, House wives 38.1%. Among all 113 respondents 62.8% were qualified in SSC level of education, 7.1% illiterate and 9.7% were Graduation and above level (Table I). Regarding quality of food 80.5% of the respondents were satisfied as good, 11.5% as very good and 8.0% as bad. It was depicted in the study that 98.2% respondents were highly satisfied with the meal service of the dietary department and stated as very good and 1.8% good, but no bad. Among all the respondents 90.3% were very pleased with the staff service issues of the dietary department and stated very good and 9.7% good, no bad. 92.0% of the respondents were happy with the physical environment and rated as good and 8.0% bad. 62.0% of the respondents were highly appreciated the option of choosing meal size as very good and 15.9% good and 22.1% bad. Out of 113 respondents 99.1% were highly satisfied about preservation of hot foods as very good and 0.99% good, but no bad. 98.2% of the respondents having no complaints about feeling hungry or food quantity and stated as good and 1.8% very good, but no bad (Table II). It also evident in the study that 83.2% of the respondents stated good about overall foodservice satisfaction, 10.6% very good and 6.2% bad (Table III).

Table I Socio-demographic characteristics of respondents (n=113)

Characteristics	Frequency	%	
Age group in years	19-38	50	44.2
	39-58	43	38.1
	59-78	20	17.7
	Total	113	100.0
Mean±SD (Years)=43.19±11.19 years			
Sex	Male	69	61.1
	Female	44	38.9

Religion	Total	113	100.0
	Islam	112	99.1
	Hinduism	1	00.9
Marital status	Total	113	100.0
	Married	105	92.9
	unmarried	5	4.4
	Widow	3	2.7
Educational qualification	Total	113	100.0
	Illiterate	8	7.1
	Primary	20	17.7
	Secondary	71	62.8
	Higher Secondary	3	2.7
Occupational status	Total	113	100.0
	Military	32	28.3
	Civil	8	7.1
	House wife	43	38.1
	Retired	20	17.7
	Others	10	8.8
Monthly family income	Total	113	100.0
	<30000	39	34.5
	30000-49999	64	56.6
	50000- 100000	10	8.9
	Total	113	100.0
Family size	2-4	66	58.4
	5-7	40	35.4
	8-10	7	6.2
	Total	113	100.0

Table II Distribution of respondents about Quality of dietary service

Service Category	Service quality	Frequency	Percent
Food quality	Very good	13	11.5
	Good	91	80.5
	Bad	9	8.0
	Total	113	100.0
Meal service quality	Very good	111	98.2
	Good	2	1.8
	Total	113	100.0
Staff service quality	Very good	102	90.3
	Good	11	9.7
	Total	113	100.0
Quality of physical environment	Good	104	92.0
	Bad	9	8.0
	Total	113	100.0
Quality of meal size	Very good	70	62.0
	Good	18	15.9
	Bad	25	22.1
	Total	113	100.0
Quality of hot food	Very good	112	99.1
	Good	1	00.9
	Total	113	100.0
Hunger and food quantity	Very good	2	1.8
	Good	111	98.2
	Total	113	100.0

Table III Distribution of respondents about overall foodservice satisfaction

Category	Frequency	Percentage
Very good	12	10.6
Good	94	83.2
Bad	7	6.2
Total	113	100.0

Table IV Association between dietary service quality and Age, Sex and monthly family income

Food quality	Age group	Very good	Good	Bad	Total	Statistics
	19-38	7	40	3	50	$\chi^2=0.943$ df=4, p>0.05
	39-58	4	35	4	43	
	59-78	2	16	2	20	
Physical environment	Male	0	64	5	69	$\chi^2=0.125$ Df=1, p>0.05
	Female	0	40	4	44	
Staff svc quality	<30000	36	3	0	39	$\chi^2=0.021$ Df=2, p>0.05
	30000-49999	59	5	0	64	
	50000-100000	9	1	0	10	

Table V Existing physical facilities in dietary department

Points	Observation	Comment
Physical facilities	Ground floor and Separate but nearer to the main hospital building	Location of dietary department should be on the ground floor. ¹⁴
Location of dietary service department	Adjacent to main road	Easily accessible to main hospital building
Easy accessibility to road	Made up of cement concrete	Floor was found smooth, non-slippery
Floor condition	Smooth and free from all unnecessary corners	Walls were clean and free from dust and dirt.
Condition of wall	Approximately 12 feet height from floor.	It allows good ventilation and lighting.
Condition of ceiling	Available	These help in the air change in dietary department
Availability of exhaust fan for air exchange	MES	Maintained with separate overhead tank of the building.
Water supply	Available	These are fixed in different areas in dietary department
Fire extinguisher	Adequate	Adequate
Space for dietary department	Food processing facilities	
Width of the receiving area	About 10 feet	Adequate
Separate initial food preparation area	Present	Separate meat cutting and vegetable unit present
Separate meat cutting area	Present	Separate meat cutting and vegetable washing area present
Vegetarian and non-vegetarian separate kitchen section	Present	This minimizes the duplication
Modified diet preparation facilities	Present	Demand for special diet is provided to kitchen as soon as patient enlisted.
Existence of menu plan in dietary department	Present	Weekly menu plan is provided to kitchen and modified diet menu also provided to kitchen time to time.
Food distribution	Central	Food is distributed centrally to the all ward. Word boy carry food via trolley to all wards of the hospital.
Kitchen staff	Adequate	Adequate

Discussion

In this study it was revealed that out of 113 respondent majority i.e. 44.2% were in 19-38 years age group followed by 38.1% in 39-58 years of age group and 17.7% were more than 58 years. The mean ages of the respondent were 43.19 years with standard deviation 11.19 years. Among all participants majority were male i.e. 61.1% and 38.9% were female. In this study majority (99.1%) respondent were Muslim followed by 0.9% Hindu. Percentages of Muslims were high among all participants as Bangladesh is a Muslim dominated country. This finding Accord with the summary D. Religion statistics of Bangladesh bureau of statistics 2020.

In this study it was shown that 92.9% respondents were married, 4.4% respondents were unmarried and 2.7% were widow. Among the respondents majority 58.4% had nuclear family i.e. 2-4 group and 35.4% were from 5-7 group and rest from the joint family. This finding differ little with summary F. type of family statistics of Bangladesh, Bangladesh bureau of statistics 2020 as study was carried out in the capital city where participants largely maintained nuclear family.

Among the respondents majority 38.1% were house wife, and 28.3% were from military service, 17.7% were retired personnel and 7.1% from the civil service.

Among the respondent 62.8% participants had qualification of secondary level which is similar to the study carried out by Sahin et al where majority of the respondents passed secondary level, it is followed by 17.7% at primary level, 9.7% were graduate and above.¹⁰ Among all respondents majority that is 56.6% had monthly family income between taka 30000-49999 followed by 34.5% below 30000 and 8.9% between Taka 50000-100000.

In this study 80.5% respondents were satisfied with food quality of the hospital. A cross sectional study conducted by Amany et al in four general hospitals in Makka, Saudi Arabia, where results showed that 78.8% of patients were satisfied with quality of food in hospitals which is very much similar to this study.¹¹ Current study also shown that respondents scored food quality by bad i.e. 8.0%

In current study 98.2% of the respondents were highly satisfied with the meal service quality of the dietary department and stated as very good and 1.8% good where a study carried out by sahin et al where found only 51.3% respondents were highly satisfied by food service quality.¹⁰

In this study it was revealed that 90.3% were very pleased with the staff service issues of the dietary department. But a study carried out by Sahin et.al where found 85.6% of the patients were satisfied with this aspect.¹⁰ Another study conducted by Amany et.al where found 78.8% were satisfied with the attitude and behavior of the staff serving foods.¹¹

In this study 92.0% of the respondents were happy with the physical environment and rated as good and 8.0% bad. A cross sectional study carried out by Amany et al where found 78.4% respondents were pleased with physical environment, similar results were observed by Alaloola and Albedaiwi.¹¹

It was evident that 62.0% of the respondents were highly appreciated the option of choosing meal size as very good and 15.9% good. In the current study 22.1% scored bad as they have no option to choose the size of their meal.

Among the respondents 99.1% were highly satisfied about preservation of hot foods as very good and 0.9% good, which was similar to the study conducted by Sahin et al and Tranter et al who did not found such association.¹⁰ Another study conducted by Nagalaa et al where he found increase satisfaction level with the hot foods.¹²

In this study 98.0% of respondents remarked hunger or food quantity as good and 1.8% very good.

Among the respondents 6.2% scored bad and 83.2% of the respondents stated good about overall foodservice satisfaction. A study conducted by Sahin et al where they found only 51.3% were satisfied with the overall food service.¹⁰ Another study carried out by Imtiaz et al where found 75.8% patients were overall satisfied with the hospital food service.¹³

In this study it was observed that dietary service department is an inpatient establishment, which is separate but adjacent to the main road and easily accessible to the main hospital building. It is located in such relationship to other areas that dust, fumes, smell, noise do not reach to the patient or personal areas. In the study of physical facility of dietary department it was found similar as mentioned in the book of Professor Salahuddin.¹ There is separate meat cutting area with washing facilities and the area is isolated from cooking area so less chance of communication of uncooked and cooked food. Vegetable unit is also separated from the cooking area. Washing, peeling, cutting facilities of vegetables are separated from cooking section.

There is separate preparation area for preparing of modified diet or non-vegetarian food. Weekly menu for the patients are provided to the kitchen every week. Hospital menus are management and communication tools between food production or service, staff and patients; they affect patient satisfaction, controlled food production and service processes and process flow from start to finish.¹⁵

Conclusion

The increasing the quality of foods and hospital food services are more likely to increase the level of overall patient satisfaction. In this study most of the respondents were satisfied with rated as very good and good with delivered service of dietary department . Food issues have a stronger impact on overall patient satisfaction than the personal relationship issue. Lack of appetite for medical reasons is probably the main cause of malnutrition in hospitals. Promoting optimal nutritional status through quality hospital foodservices can lead to a faster recovery and decreased length of hospital stay which can have a large impact on hospital costs.

Disclosure

Both the authors declared no competing interests.

References

1. 'Hospital management' book by Professor A K M Salahuddin, 2nd edition, 1999;130-138.
2. Masoodi, Nayera. Evaluation of nutrition services in registered hospitals of Srinagar and recommendations for optimizing nutrition care of patients. Shodhganga: A reservoir of Indian theses. 2017.
3. Shikha Jha. Grain price stabilization in India: Evaluation of policy alternatives. Agricultural economics. The journal of the International association of agricultural economists. 2018.
4. Farnando GHS, Wijesinghe CJ, Quality and standards of hospital food service: A critical analysis and suggestions for improvements, Galle Medical Journal. 2017;22(2).
5. Sheuly B, Khorshed A M, Aseesh K S, China R M and Mst. Jannat A A. Management of dietary services at National Institute of Cancer Research and Hospital (NICRH), Bangladesh. Asian Journal of Medical and Biological Research. 2018.
6. Kyungjoo Kim, Minyoung Kim and Kyung-Eun Lee. Assessment of foodservice quality and identification of improvement strategies using hospital foodservice quality model. Nutrition Research and Practice (Nutr Res Pract) 2010.
7. Saroj B. Issues in feeding the terminally ill patient. Indian Diabetic Association. 1989; 22:46-62.
8. Gabriele M, Roberto F, Francesco V, Fabrizio N, Cecilia Q N N. Patients' evaluation of hospital foodservice quality in Italy: What do patients really value. Public Health Nutrition. 2012;16(4).
9. Vanessa A T. Improving Patient Satisfaction in a Hospital Foodservice System Improving Patient Satisfaction in a Hospital Foodservice System Using Low-Cost Interventions: Determining Whether a Room Using Low-Cost Interventions: Determining Whether a Room Service System is the Next Step. 2014.
10. Sahin B, Demir C, Celik Y, Teke K. Factors affecting satisfaction level with the food services in a military hospital. J Med Syst. 2006;30:381-387.
11. Amany M A, Lina A Q, Reem A Z, Aroob K, Shobki, Haneen M. Analysis of factors Affecting the satisfaction levels of patients Toward foodservices at General Hospitals in Makka, Saudi Arabia. American Journal of Medicine and Medical sciences 2012.
12. Naglaa A E, Eman H I and Mahmoud M H. Patients' satisfaction with Delivered Food services in Fayoum hospitals. EC Nutrition. 2017;9:2.
13. Ahmed I, Muizuddin A C, Zannatul F, Hafiza S, Md. Motiur R, Md. Haroon R. Management of Dietary services in Secondary level hospitals. Asian Journal of Medicine and Health 18(1): 48-57,2020; Article no.AJMAH.54401.
14. John R. McGiboni, M.D. 1903-1986. Hospital Topics. 1987;65(1):1. <https://doi.org/10.1080/00185868.1987.10543582>.
15. Cousins, L., Tansley, D. and Hepburn, L. Investigation into the Dietary Habits of the Eurasian otter (Lutra lutra) in the country of Essex. IUCN Otter Spec. Group Bull. 2011;28 (2):76-83.

Angiographic Severity and Outcomes of ST Segment Elevation Myocardial Infarction in Association with Reciprocal ST Segment Depression

Mohammad Nizamul Hossain Sowdagar^{1*} Zahida Jabbar² Reza Ershad³ Md Aminul Haque⁴ Sarwar Hossain⁵

ABSTRACT

Background: The importance of reciprocal ST segment depression throughout acute infarct has been a region of dialogue, whether or not it is a symptom of multivessel diseases, ischemia at a distance or just a benign physical phenomenon. To find out the Angiographic severity and outcomes of ST segment elevation myocardial infarction in association with reciprocal ST segment depression.

Materials and methods: A prospective, controlled study using purposive sampling method. Study conducted in Cardiology Department of Combined Military Hospital (CMH) Dhaka, Bangladesh from July 2019 to June 2020 as in-patient basis involving two hundred ST elevation infarction patients (one hundred inferior, one hundred anterior). Every cluster was sub-grouped into a pair of subgroups consistent with the presence of reciprocal ST segment depression or absence: in anterior STEMI cluster we have a tendency to get subgroup A1 with RSTD (41 patients) and subgroup A2 while not RSTD (59 patients) whereas in inferior STEMI cluster every sub-group (B1 and B2) consisted of fifty patients. Coronary angiography was done in all patients within 15 days of acute ST segment elevation MI with RSTD and non-RSTD having including primary PCI, thrombolytic therapy and S/C LMWH.

Results: This study revealed patients with reciprocal ST segment depression showed a significant lower mean left ventricular ejection fraction and coronary artery disease of greater extent compared to those without (37 + 3% vs 53 + 5% p < 0.001, anterior ST elevation myocardial infarction subgroups) & (47 + 4% vs 60 + 3% p < 0.001, inferior ST elevation myocardial infarction sub-groups). Multivessel disease was higher incidence of found in subgroups with reciprocal ST segment depression (80.5% vs 49.2%, p < 0.001 in ST elevation anterior myocardial infarction) & (60% vs 20%, p < 0.001 in inferior ST elevation myocardial infarction). The mean Gensini score was higher in subgroups with reciprocal ST segment depression (64.2 + 12.6 vs 30.2 + 6.6, p < 0.001 in anterior infarction group) & (36.2 + 10.6 vs 20.4 + 4.2, p < 0.001 in inferior infarction group).

Conclusion: Reciprocal ST segment depression in acute ST elevation myocardial infarction associated with significant LV systolic dysfunction and coronary artery disease of greater extent.

Key words: Modified Gensini Score (MGS); Percutaneous Coronary Intervention (PCI); Reciprocal ST Depression (RSTD); ST Elevation Myocardial Infarction (STEMI).

Introduction

Among a lot of examinations performed in the Acute Myocardial Infarction (AMI) setting, the Electrocardiogram (ECG) remains the broadly acknowledged and effectively done test for the diagnosis.¹ The ECG changes reflect the

picture of the affected myocardial territory.² Reciprocal ST Segment Depression (RSTD) is a typical ECG finding frequently going with ST Segment Elevated Myocardial infarction (STEMI). The ST depression may point to ischemia in a myocardial area other than the zone of infarction or may represent merely a benign electrical phenomenon. There is bottomless writing concerning the hugeness of various sorts of ST depression in STEMI.³ In anterior myocardial infarction, ST depression encountered in inferior leads might be corresponding to contribution of the basal anterolateral region supplied by the first diagonal branch and observed as ST segment elevation in leads I and aVL.⁴ Myocardial infarction is the term applied to myocardial necrosis secondary to acute interruption of coronary blood supply.⁵ The earliest changes seen with an acute transmural infarct are usually in the ST-T complex.⁶ In acute transmural infarct, ECG shows typical ST segment elevation (termed "indicative" changes) in the leads facing the area of infarction. Apart from these ST segment elevation changes, the leads remote from the area of infarct often show

1. Lt Col & Cardiologist
Combined Military Hospital (CMH) Dhaka.
2. Assistant Professor of Ophthalmology
Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka.
3. Brig Gen & Principal
Army Medical College Chattogram, Chattogram.
4. Lt Col & Cardiologist
Combined Military Hospital (CMH) Chattogram.
5. Major & Graded Specialist in Cardiology
Combined Military Hospital (CMH) Dhaka.

*Correspondence: **Dr. Mohammad Nizamul Hossain Sowdagar**
Cell: +8801712 04 94 52
Email: daiyan53@yahoo.com

Submitted on : 2nd November 2021
Accepted on : 24th November 2021

ST segment depression, which is not always present even when the ST elevation is extreme. Again when reciprocal ST segment depression is present, it does not always have the same time course as the ST segment elevation. This observation makes the issue more controversial.⁷ Reciprocal ST-segment depression during acute myocardial infarction is a common finding occurring in about 54-82 % cases. The aetiology and significance of these reciprocal ST segment changes has been the subject of several conflicting reports over the years.⁷ In patients with inferior myocardial infarction, the presence of ST segment depression in lead aVL is a reciprocal change and is found in nearly all patients, while ST depression in leads V1-V3 most likely does not imply "ischemia at separate zone" yet rather reciprocal changes.^{8,9} Interestingly, among patients with inferior STEMI, ST segment depression in leads V4-V6 is linked with associative Left Anterior Descending (LAD) coronary artery stenosis or three vessel disease representing ischemia at a distance.¹⁰

To find out the angiographic severity and outcomes of ST segment elevation myocardial infarction in association with reciprocal ST segment depression.

Material and methods

The current study was conducted as a prospective, controlled single center study involving two hundred patients with ST elevation myocardial infarction who were admitted to the Cardiology Department of Combined Military Hospital (CMH) Dhaka, Bangladesh and had undergone coronary angiogram with PCI result in the correlation of angiographic severity in patients with ST segment elevation myocardial infarction association with reciprocal ST segment depression period between July 2019 and June 2020.

Inclusion criteria

- The study enclosed patients diagnosed to own either acute inferior wall infarction or acute anterior wall infarction. ECG was recorded on admission and unconcealed changes of acute infarction i.e ST phase elevation 1 millimeter in a minimum of 2 adjacent leads representing either the inferior wall (Leads II, III, aVF) or 2 millimeter the anterior wall (V1-V6, I, aVL) in conjunction with typical angina for a minimum of thirty mins and upto twelve hours and significantly raised cardiac biomarker (Troponin).

- The designation of STEMI was then confirmed by coronary angiography (The thrombotically occluded infarct related vessel) that was after revascularized throughout the procedure.

Exclusion criteria

- Patients with STEMI who were subjected to undergone PCI and had an intra-procedural complication or absence of angiographic or procedural success were barred from the study (to avoid the confounding impact of procedural complications on the in hospital outcome that may interfere with the point of interest of evaluate only the impact of RSTD).

- Other exclusion criteria were: Left Bundle Branch Block (LBBB) associated intra-ventricular conduction disturbances, right ventricular infarction, posterior infarction, paced ECG rhythm & patients with disseminated malignancies.

We recorded data on age, sex, history of diabetes mellitus, history of essential hypertension, the presence of dyslipidemia, positive family history of coronary artery disease & any comorbidity (Cerebrovascular accidents, chronic kidney disease, liver disease, COPD or bronchial asthma). A standard 12-lead ECG was recorded immediately after admission & the diagnosis of STEMI was confirmed (Whether anterior or inferior STEMI). We define Reciprocal ST Segment Depression (RSTD) as the presence of ST depression >1 mm in at least two out of the precordial leads V1-V6 or V₂-V₃ and 0.05 mm in I & aVL leads (Anterior RSTD in inferior STEMI) or ST depression >1 mm in the inferior leads II, III, aVF leads (Inferior RSTD in anterior STEMI). All the studied patients were subjected to a full echocardiography with special emphasis on the Left Ventricular Ejection Fraction (LVEF%). All patients had undergone coronary angiography to determine the culprit lesion followed by underwent Percutaneous Coronary Intervention (PCI) as the selected reperfusion therapy and the cut point used to define a significant coronary stenosis was the presence of 70% coronary luminal stenosis. We also recorded extent (Single, two or multi vessel disease) & severity of CAD using modified Gensini score which graded the degree of narrowing of the coronary arteries as 1 point for 1–25% narrowing, 2 for 26–50% narrowing, 4 for 51–75% narrowing, 8 for 76–90% narrowing, 16 for 91–99% narrowing & 32 for total occlusion.¹¹ After calculation, the score was then multiplied by a factor according to the lesion's location in the coronaries (5 for left main disease, 2.5 for proximal LAD & proximal LCX (3.5 if the LCX is dominant) 1.5 for mid-LAD, 1 for the distal LAD, 1st diagonal, proximal, mid & distal regions of RCA, mid & distal regions of LCX & obtuse marginal or posterior descending branch, 0.5 for the 2nd diagonal or posterolateral branch. Finally, the score was expressed as the sum of the scores for the all coronary arteries.¹¹

Standard 12 lead ECGs were performed on all the patients during their admission. All ECGs were recorded at 25mm/sec. The magnitude of ST-segment deviation was measured from baseline (TP segment). For the diagnosis of acute inferior myocardial infarction, patients should have >1 mm of ST segment elevation (Measured 80 ms after the J point of QRS complex) in leads II, III, aVF. Significant ST depression was defined as 1 mm or greater horizontal or downward ST segment depression measured at 80 ms after J point in leads V1-V6. The maximal ST segment elevation in any inferior lead and maximal ST segment depression in any precordial leads were recorded and reversed is noted in case of anterior myocardial infarction. Then ST segment elevations were summed and mean was calculated.

Numerical variables were described as Mean±SD. Categorical variables were described as percentages. Comparisons were done using student t-test for numerical variables and chi square test for categorical variables. The independent contribution of variables was assessed using a multivariate regression analysis. Statistics were calculated using standard “SPSS” package.

Results

This study included 200 patients and were 44% females and 56% males. The mean age was 51.8 ± 15.6 years. 100 admitted patients were with acute anterior wall myocardial infarction and 100 patients were diagnosed as acute inferior wall myocardial infarction. Patients admitted with anterior wall myocardial infarction (Group A 100 patients) were further sub-grouped into two sub-groups according to the presence of Reciprocal ST Segment Depression (RSTD) in the inferior leads II, III, aVF (Subgroup A1, 41 patients) or absence (subgroup A2, 59 patients). Comparing the two subgroups (A1 & A2) regarding the baseline demographic & clinical characteristics, we found that subgroup A1 showed a statistically significant higher prevalence of diabetes mellitus and there was no statistically significant difference between the two subgroups regarding the prevalence of HTN, dyslipidemia, family history of CAD, cigarette smoking or any other comorbid illness. There was no statistical significant difference between the 2 subgroups A1&A2 regarding either angina to balloon time (55 ± 22 versus 52 ± 26 mins, p value 0.74) or door to balloon time (25 ± 10 versus 23 ± 12 mins, p value 0.66). Regarding echocardiographic data, we found a statistically significant lower mean ejection fraction in subgroup A1 compared to subgroup A2 (37% vs 53%, p value <0.001). Echocardiographic evidence of Regional Wall Motion Abnormalities (RWMAs) in anterior segments were found in all patients in the 2 subgroups whereas RWMAs in areas of the left ventricle remote from the infarction were seen in the 2 subgroups (A1 & A2) yet with no statistical difference (48.8% versus 50.8%, p value 0.45). All patients in group A (Anterior STEMI) were subjected to undergone PCI of the culprit vessel (LAD in 100% of cases). Each patient included in the two subgroups received a single stent, the length of the stent was selected according to the discretion of the operator.

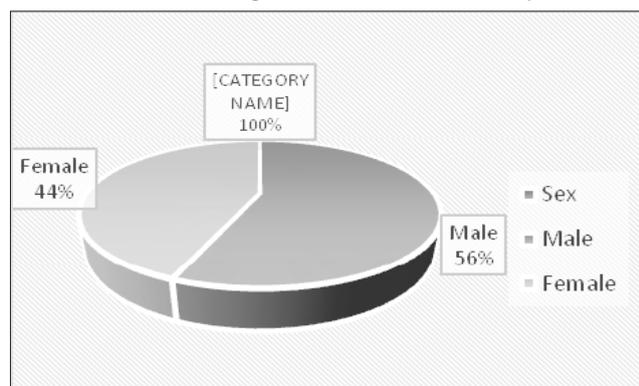


Figure 1 Sex distribution of the patients

Table I Acute anterior wall myocardial infarction (Group A) data (n=100)

Parameters	Subgroup A1 (Inferior RSTD) 41 patients	Subgroup A2 (No inferior RSTD) 59 patients	p value
Age	53.3 ± 17	50.3 ± 14.2	0.331
Male (%)	51.2%	52.6%	0.822
Diabetes mellitus	73.2%	32.2%	<0.001
Hypertension	53.7%	37.3%	0.078
Dyslipidemia	22%	23.7%	0.412
Family history of CAD	25.4%	26.8%	0.522
Cigarette smoking	64.4%	70.7%	0.33
History of CVA	12.2%	10.2%	0.55
History of renal impairment	9.8%	6.8%	0.38
History of chest disease	19.5%	25.4%	0.43
Echocardiography:			
Ejection fraction (EF %)	37 ± 3	53 ± 5	< 0.001
Cardiac biomarkers:			
Troponin	25.00±0.00	15±0.81.	<0.001
Angiographic data:			
Lesion length	21 ± 5	24 ± 6	0.33
Percent stenosis	95 ± 5	95 ± 5	NS
TIMI III post PCI	100%	100%	NS
Acute stent thrombosis	0%	0%	NS
TLR	0%	0%	NS
Multivessel CAD	80.5%	49.2%	<0.001
Significant RCA lesions	75.6%	42.4%	<0.001
Significant LCX lesions	48.8%	27.1%	0.023
MGS	64.2 ± 12.6	30.2 ± 6.6	<0.001

We found a statistically significant higher incidence of multi-vessel disease in subgroup A1 compared to subgroup A2 (80.5% vs 49.2%, p value < 0.001). There was a statistically higher incidence of significant RCA lesions in subgroup A1 compared to subgroup A2 (75.6% vs 42.4%, p value < 0.001) higher incidence of significant LCX lesions in subgroup A1 compared to subgroup A2 (48.8% vs 27.1%, p value: 0.023) and higher mean value of Modified Gensini Score (MGS) in subgroup A1 compared to sub-group A2 (64.2 ± 12.6 vs 30.2 ± 6.6 , p value < 0.001). In a multivariate analysis, the presence of DM (p 0.02), reciprocal ST segment depression (p 0.01) and impaired LV systolic function (p 0.034) were independently correlated with the presence of multivessel coronary artery disease. Concerning the in-hospital outcome, subgroup A1 showed a statistically significant lower mean arterial pressure (91.8 ± 20.6 mmHg vs 103.4 ± 17.6 , p < 0.001), higher need for vasopressor use (78% vs 33.9, p value <0.001), higher incidence of Bradyarrhythmias (48.8% vs 25.4%, p value 0.025), or the in-hospital death (9.76% versus 10.17%, p value 0.72). Statistical significant difference between 2 subgroups regarding: incidence of ventricular tachycardia (26.8% vs 25.4%, p: 0.527) need for mechanical ventilation (39% vs 27.1%, p: 0.11), the duration of ICU stay (7.3 ± 2.2 vs $5.5 \pm$

1.6 days, p value: 0.08). There was no statistical significant difference between the 2 subgroups regarding the site of LAD occlusion whether proximal in 20 patients in subgroup A1 (48.8%) and in 29 patients in subgroup A2 (49.2%) or mid-part in 21 patients in subgroup A1 (51.2%) and in 30 patients in subgroup A2 (50.8%). Procedural success (Achieving TIMI III flow with residual diameter stenosis 62%) was achieved in all patients.

Table II Acute anterior wall myocardial infarction (n=100)

Outcome Data:			
Mean Arterial Pressure (MAP)	91.8 ± 20.6	103.4 ± 17.6	<0.001
Need for vasopressor	78%	33.9%	<0.001
Brady arrhythmia	48.8%	25.4%	0.025
Ventricular tachycardia	26.8%	25.4%	0.527
Mechanical ventilation	39%	27.1%	0.11
Duration of ICU stay days	7.3 ± 2.2	5.5 ± 1.6	0.08

There was no statistical significant difference regarding the time of resolution of ST segment elevation (i.e resolution >70%) following the undergone PCI in the 2 subgroups (90 ± 20 mins versus 88 ± 26, p value 0.44). Regarding the supply of the inferior wall, there was no statistical significant difference between the 2 subgroups as follows: In subgroup B1: inferior wall was supplied by RCA in 22 patients (51.2%) LCX in 10 patients (24.4%) and both RCA and LCX (Co-dominance) in 10 patients (24.4%). In subgroup A1: inferior wall was supplied by RCA in 31 patients (52.54%), LCX in 14 patients (23.73%) and both RCA and LCX (Co-dominance) in 14 patients (23.73%). (p-value: 0.89). Regarding the supply of the LV apex, we found no statistically significant difference between the two subgroups as follows: In subgroup A1: LV apex was supplied by LAD in 37 patients (90.2%), PDA in 2 patients (4.9%) and from both LAD and PDA in 2 patients (4.9%). In subgroup A2: LV apex was supplied by LAD in 53 patients (89.8%), PDA in 3 patients (5.1%) and from both LAD and PDA in 3 patients (5.1%), (p-value:0.91).

Patients admitted with Acute Inferior Wall Myocardial Infarction (Group B, 100 patients) were further sub-grouped into two sub-groups according to the presence of reciprocal ST segment depression in the precordial leads V1-V6 or I & aVL leads (Sub-group B1, 50 patients) or absence (Subgroup B2, 50 patients). There was no statistically significant difference between the two subgroups (B1 & B2) regarding demographic data, risk factors for coronary artery disease or any other co-morbidities. We did not find any statistical significant difference between the 2 subgroups B1 & B2 regarding either angina to balloon time (68 ± 24 versus 67 ± 26 mins, p value 0.82) or door to balloon time (35 ± 14 versus 34 ± 15 mins, p value 0.9). Echocardiographic assessment of group B patients revealed that mean EF was significantly lower in subgroup B1 compared to subgroup B2 (47% vs 60%, p value < 0.001). Echocardiographic evidence of Regional Wall Motion Abnormalities (RWMAs) in inferior segments was found in all patients in the 2 subgroups whereas RWMAs in

areas of the left ventricle remote from the infarction were seen in the 2 subgroups (B1&B2) with no statistical difference (20% versus 24%, p value 0.34). All patients in group B were subjected to undergone PCI of the culprit vessel (RCA in 80%, LCX in 20%). Each patient included in the two subgroups received a single stent, the length of the stent was selected according to the discretion of the operator and based on the lesion length. There was no statistical significant difference between the 2 subgroups regarding the site of occlusion within the culprit vessel (Whether RCA or LCX) as it was proximal in all patients in either sub-group. Procedural success was achieved in all patients. There was no statistical significant difference between the 2 subgroups regarding the time of resolution of ST segment elevation (i.e resolution >70%) following the underwent PCI (60 ± 18 mins versus 55 ± 21, p value 0.28). The supply of the inferior wall was similar in the two sub-groups (RCA in 40 patients in each subgroup and LCX in 10 patients in each subgroup). Regarding the supply of the LV apex, we found no statistically significant difference between the two subgroups.

Table III Acute inferior wall myocardial infarction (Group B) data (n=100)

Parameters	Subgroup B1 (With anterior RSTD) (50 patients)	Subgroup B2 (No anterior RSTD) (50 patients)	p value
Age	50.2 ± 18.1	53.2 ± 12.9	0.211
Male (%)	72%	68%	0.106
Diabetes mellitus	34%	32%	0.822
Hypertension	26%	24%	0.794
Family History of CAD	22%	24%	0.802
Dyslipidemia	38%	54%	0.079
Cigarette smoking	64%	70%	0.32
History of CVA	6%	8%	0.52
History of renal impairment	10%	12%	0.48
History of chest disease	20%	28%	0.29
Echocardiography:			
EF%	47 ± 4	60 ± 3	<0.001
Cardiac biomarkers:			
Troponin I (ng/mL)	26.3 ± 10.6	12.4 ± 8.9	0.018
Angiographic data:			
Lesion length	18 ± 6	16 ± 7	0.56
Percent stenosis	95 ± 5	90 ± 5	0.22
TIMI III post PCI	100%	100%	NS
Acute stent thrombosis	0%	0%	NS
TLR	0%	0%	NS
Multivessel disease	60%	20%	<0.001
Significant LAD lesions	78%	24%	<0.001
MGS	36.2 ± 10.6	20.4 ± 4.2	<0.001
Outcome data:			
MAP	84.8 ± 17.1	85 ± 19.3	0.89
Need for vasopressor	34%	32%	0.822
Need for MV	24%	22%	0.802
Brady arrhythmia	16%	14%	0.794
Ventricular tachycardia	30%	28%	0.92
ICU stay (days)	7.4 ± 3	6.2 ± 3.1	0.325

In subgroup B1: LV apex was supplied by LAD in 40 patients (80%), PDA in 2 patients (4%) and from both LAD and PDA in 8 patients (16%). In subgroup B2: LV apex was supplied by LAD in 39 patients (78%), PDA in 3 patients (6%) and from both LAD and PDA in 8 patients (16%), (P value: 0.78). The incidence of multivessel disease was significantly higher in subgroup B1 (60% vs 20%, p value < 0.001). Significant LAD lesions were significantly higher in subgroup B1, compared to the subgroup B2 (78% vs 24%, p value < 0.001). Also, the mean value of MGS was significantly higher in subgroup B1 compared to subgroup B2 (36.2 ± 10.6 vs 20.4 ± 4.2 , p value < 0.001). In a multivariate analysis, the presence of reciprocal ST segment depression (p 0.02) and impaired LV systolic function (p 0.042) were independently correlated with the presence of multivessel coronary artery disease.

Discussion

The significance of reciprocal ST segment depression during the early phases of acute myocardial infarction has been an area of debate, whether it is a sign of multivessel disease, ischemia at a distance and poor prognosis or merely a benign electrical phenomenon.¹²⁻¹⁴ We aimed at evaluation of the relevance of reciprocal ST segment depression in patients with acute anterior & inferior myocardial infarction as regards the left ventricular systolic function & the extent of coronary artery disease. The current study was conducted as a prospective controlled single center study on 200 patients who were diagnosed as having STEMI (Anterior or inferior) & admitted to the Combined Military Hospital (CMH), Dhaka, Bangladesh. Echocardiographic assessment was performed for the whole studied patients, we found that patients presented with reciprocal ST segment depression (Whether with anterior or inferior STEMI) showed a statistically significant lower mean ejection fraction when compared to those patients without RSTD (37% vs 53%, p < 0.001 in anterior STEMI group) & (47% vs 60%, p < 0.001 in inferior STEMI group) this goes hand in hand with the data published by Zoghi et al (Studied one hundred eighty-eight patients with acute inferior MI who received thrombolytic therapy as the reperfusion therapy) they concluded that those patients presented with RSTD in non-infarcted leads show a statistically significant lower mean ejection fraction ($49\% \pm 19\%$) compared to those who presented without such RSTD ($52 \pm 15\%$) (p value < 0.001).¹⁵ Also Parale et al. (Study on 300 patients of acute myocardial infarction: 180 anterior & 120 inferior) concluded that anterior STEMI patients without reciprocal changes in the inferior leads have a better LVEF & patients with inferior STEMI with ST segment depression in apicolateral leads have higher prevalence of significant LV dysfunction.¹ Similarly, Gibelin et al found that the persistence of ST segment depression in non-infarcted leads in inferior STEMI for >48 hrs was associated with a more severe depression of the left ventricular ejection fraction & that the group presented with

RSTD showed a significantly lower EF compared to those presented without RSTD ($52.2 \pm 6\%$ vs $59.2 \pm 7\%$, p value < 0.005).¹⁶ Discordant to our results, Celik & his colleagues (Studied patients with a first inferior wall myocardial infarction) concluded that there was no statistical significant difference between those patients presented with RSTD & those without RSTD as regards the ejection fraction, in addition, they concluded that RSTD during early phases of inferior infarction is an electrical reflection of undergone ST segment elevation in the area of infarction, the discrepancy between their results & ours could result from the difference in the number of studied patients (48 patients in their study & 200 patients in our study) also the difference in the clinical settings (Inferior MI in their study in comparison to both anterior & inferior MI in our study).¹⁷ The postulation that patients with acute MI who presented with RSTD in the non-infarcted leads have higher incidence of multivessel coronary artery disease was proved in the current study which revealed that patients with acute MI (Whether anterior wall or inferior wall) who presented with RSTD show a statistically significant higher incidence of multivessel CAD on their coronary angiograms compared to those who presented without RSTD (80.5% vs 49.2% respectively, p < 0.001 in anterior MI) & (60% vs 20% respectively, p < 0.001 in inferior MI). This conclusion was concordant with that stated by Zoghi et al., they found that multivessel CAD was present in 58% of patients with RSTD & 40% of patients without RSTD (p < 0.02) Parale et al concluded that patients of acute inferior wall myocardial infarction with RSTD in apicolateral leads have more occurrence of multivessel disease, however those with acute anterior wall MI with RSTD showed a higher incidence of multivessel disease yet with no statistical significance (The lack of the statistical significance in their study could be explained by the fact that only 12 patients underwent coronary angiography out of total 110 patients presented with anterior wall MI & reciprocal ST-T changes in inferior leads, so they could reach statistical significance of this subset of patients if a higher proportion of the studied patients were subjected to coronary angiography, but in our study all the studied patients were subjected to coronary angiography).^{15,1} Contrary to our results, Quyyimi AA et al in a study of controlled coronary occlusion during angioplasty, stated that reciprocal change is not common in patients with multivessel disease than in those with single vessel disease.¹⁸ We found a statistically significant higher incidence of significant RCA & LCX lesions in those patients with acute anterior MI & inferior RSTD compared to those without RSTD & similarly higher incidence of significant LAD lesions in those patients with acute inferior MI & anterior RSTD compared to those without RSTD, this result goes hand in hand with that published by Hakim et al. who stated that the presence of RSTD in precordial leads during inferior STEMI was associated with more frequent left coronary artery disease.¹⁹ The extent of coronary artery disease was assessed in the current study

using the modified Gensini Score, our data revealed that comparing those patients with RSTD & those without RSTD in the Anterior MI group revealed (64.2 ± 12.6 vs 30.2 ± 6.6 , p value < 0.001) & in the inferior MI group (36.2 ± 10.6 vs 20.4 ± 4.2 , P value < 0.001).¹¹ This conclusion obviously revealed that the presence of RSTD was associated with increased extent of coronary artery disease & are in an agreement with Hakim K & Co-Workers who demonstrated a significant positive linear correlation between the presence of reciprocal ST segment depression in non-infarcted leads & gensini score ($r = 0.68$, $p < 0.05$).¹⁹ We did not find any statistically significant impact of the site of coronary artery occlusion (i.e LAD) in anterior STEMI group on the presence of reciprocal ST segment depression. Discordant to our results those stated by Noriega et al who concluded that only the proximal LAD occlusion in anterior STEMI patients resulted in reciprocal ST-segment depression in leads II, III, and aVF ($p < 0.001$).²⁰ However, in inferior STEMI group in our study, the occlusion was proximal in all patients (Whether RCA or LCX occlusion) in either subgroup, so actually we could not assess the impact of the site of coronary artery occlusion on the presence of reciprocal ST segment depression. Birnbaum and his colleagues concluded that in inferior wall myocardial infarction, patients with maximum ST depression in leads V1 to V3 less often had proximal right coronary artery occlusion (23.9%) than those patients without precordial ST depression (35.2%) yet in a recent study carried by Noriega FJ and his colleagues, they concluded that proximal and mid-distal occlusion of RCA or LCX coronary artery always induce ST-segment elevation in leads II, III, and aVF and reciprocal ST-segment depression in leads V2 and V3, i.e. reciprocal ST segment depression in inferior STEMI might occur with any segment occlusion in RCA or LCX.^{10,20}

Conclusion

Reciprocal ST Segment depression in non-infarcted leads in the setting of acute ST elevation infarct (Anterior or inferior) was related to LV systolic dysfunction and extent of arterial blood vessel involvement. ST segment depression in acute myocardial infarction at reciprocal leads was associated with significant LV systolic dysfunction and coronary artery disease of greater extent.

Disclosure

All the authors declared no competing interests.

References

1. Parale GP, Kulkarni PM, Khade Sk, Swapna A, Amit V. Importance of reciprocal leads in acute myocardial infarction. *JAPI*. 2004; 52:376–379.
2. Edmundo JN, Camara MD, Nisha Chandra MD, Pamela Ouyang MD, Sheldon H, Gottlieb MD, Shapiro Edward P. Reciprocal ST change in acute myocardial infarction: assessment by electrocardiography and echocardiography. *J Am Coll Cardiol*. 1983; 2:251–257.
3. Becker R, Alpert J. Electrocardiographic ST segment depression in coronary heart disease. *Am Heart J*. 1988; 115:862–868.
4. Arbane M, Goy JJ. Prediction of the site of total occlusion in the left anterior descending coronary artery using admission electrocardiogram in anterior wall acute myocardial infarction. *Am J Cardiol*. 2000; 85:487–491.
5. Julian DG, Cowan JC. *Cardiology. Coronary heart disease—clinical manifestations*. 6th ed. London: ELBS publications, B Tindall. 1992; 24: 105-135.
6. Goldschlager N, Goldman MJ, *Principles of clinical electro- cardiography* 13th ed. East Norwalk: Lang e medical book, prentice hall international INC. 1989:012-12.
7. Dewhurst NG, Muir AL, clinical significance of reciprocal ST- segment depression in acute myocardial infarction. *Am J, med*. 1985; 78:765-770.
8. Birnbaum Y, Sclarovsky S, Mager A, Strasberg B, Rechavia E. ST segment depression in aVL: A sensitive marker for acute inferior myocardial infarction. *Eur Heart J*. 1993; 14:4–7.
9. Peterson ED, Hathaway WR, Zabel KM, Pieper KS, Granger CB, Wagner GS et al. Prognostic significance of precordial ST segment depression during inferior myocardial infarction in the thrombolytic era: results in 16; 521 patients. *J Am Coll Cardiol*. 1996; 28:305–312.
10. Birnbaum Y, Wagner GS, Barbash GI, Gates K, Criger DA, Sclarovsky S, et al. Correlation of angiographic findings and right (V1 to V3) versus left (V4 to V6) precordial ST segment depression in inferior wall acute myocardial infarction. *Am J Cardiol*. 1999; 83:143–148.
11. Gensini GG. A more meaningful scoring system for determining the severity of coronary heart disease. *Am J Cardiol*. 1983; 51(3):606.
12. Mirvis DM. Physiologic bases for anterior ST segment depression in patients with acute inferior wall myocardial infarction. *Am Heart J*. 1988; 116:1308–1322.
13. Little WC, Rogers EW, Sodoms MT. Mechanisms of anterior ST segment depression during acute inferior myocardial infarction. *Ann Intern Med*. 1984; 100:226–229.
14. Wasserman AG, Ross AM, Bogaty D. Anterior ST segment depression during acute inferior myocardial infarction: evidence for the reciprocal change theory. *Am Heart J*. 1983; 105:516–520.
15. Zoghi M, Gugun C, Yavuzgi O, Turko I, Kultusay H, Akilli A et al. The angiographic correlation between ST segment depression in non-infarcted leads and the extent of coronary artery disease in patients with acute inferior myocardial infarction: A clue for multivessel disease. *Can J Cardiol*. 2003; 19(1):67–71.
16. Gibelin P, Gilles B, Baudouy M, Guarino L, Morand P. Reciprocal ST segment changes in acute inferior myocardial infarction: clinical, hemodynamic and angiographic implications. *Eur Heart J*. 1986; 7(2):133–139.

17. Celik S, Yilmaz R, Baykan M, Orem C, Erdol C. Are reciprocal changes a consequence of “ischemia at a distance” or merely a benign electrical phenomenon? A pulsed wave tissue Doppler echocardiographic study. *Ann Noninvasive Electrocardiol.* 2003; 8(4):302–307.

18. Quyyumi AA, Crake T, Rubens MB, Levy RD, Rickards AF, Fox KM. Importance of “reciprocal” electrocardiographic changes during occlusion of left anterior descending coronary. *Lancet.* 1986; 1:347–350.

19. Hekim K, Mehmed Y, Yusuf K, Zekeriya K, Hasan K, Selçuk P et al. Importance of reciprocal ST segment depression in the extensive coronary artery disease. *Eur J Gen Med.* 2010; 7(1):88–91.

20. Noriega FJ, Vives-Borrás M, Solé-González E, García-Picart J, Arzamendi D, Cinca J. Influence of the extent of coronary atherosclerotic disease on ST-segment changes induced by ST elevation myocardial infarction. *Am J Cardiol.* 2014; 113(5):757–764.

The Role of Metformin in Menstrual Regulation and Body Weight Reduction in Polycystic Ovary Syndrome

Shamima Yasmin^{1*} Reza Ershad² Jebunnessa Begum³

ABSTRACT

Background : Polycystic Ovary Syndrome (PCOS) is the most frequent cause of menstrual disorders of women in Bangladesh. The main goal of this study is to evaluate the role of metformin in menstrual regulation and body weight reduction in Polycystic ovary syndrome.

Materials and methods : This cross sectional study was carried out at Combined Military Hospital (CMH) Chattogram from 2016 to 2018. 60 women with Polycystic ovary syndrome, ranging in age from 18 to 26 years were enrolled in the study received 1500 mg/day metformin as tablets uninterruptedly for 6 months.

Results: During the study, most of the patients were belong to 21-23 years age group (60%). 35% had family history of Polycystic ovary syndrome and 44% had obesity in past family history. Besides that, mean BMI was 26.17±5.62 kg/m² whereas mean Serum TSH, was 2.21±1.11 mIU/ml.

In addition, after metformin intervention, 89% patients had their menstrual cycle regular. Besides that, before metformin intervention 49% cases were obese which was shifted to 25% after metformin intervention. Besides that, S. progesterone level was improved into 5.16±5.20ng/ml. Apart from all positive outputs, complication like loose motion seen in 55% cases, followed by vomiting in 35% cases and nausea seen in 40% cases after metformin intervention.

Conclusion: The present results confirm the positive effects of metformin on menstrual periods and show that the drug can be administered to young women to improve ovulation and hyperandrogenic symptoms like weight gain.

Key words : Metformin; Menstrual cycle; Polycystic Ovary Syndrome (PCOS).

Introduction

The most prevalent endocrine condition among women of reproductive age is Polycystic Ovarian Syndrome (PCOS). Polycystic Ovary Syndrome is characterized by anovulatory menstruation, infertility, hyperandrogenism and clinically expressed by irregular menstruation, hirsutism, obesity, and acne and hence has characteristics with other metabolic syndromes.¹

It is a diverse condition with an unknown origin, although there is considerable evidence that complex interactions between genetic, environmental, and behavioral variables play a role in the development of this syndrome.²⁻³

The prevalence of *polycystic ovary syndrome* in women of reproductive age is estimated to be 5 to 10%.⁴

Insulin-lowering medicines have become increasingly employed in the treatment of *Polycystic ovary syndrome* in the last ten years, notably for the stimulation of ovulation.⁵ Many studies have shown that metformin, a biguanide generally used to treat non-insulin-dependent diabetes, is

effective in triggering ovulation in *polycystic ovary syndrome* patients.⁶

Metformin is the most extensively researched insulin-lowering medication used to treat *polycystic ovary syndrome*. *Metformin* it increases insulin sensitivity in the liver, and it suppresses hepatic glucose production and improves glucose absorption and utilization in muscle.⁷

In this study, our main goal is to evaluate the efficacy of metformin in menstrual regulation and body weight reduction in and Polycystic ovary syndrome to assess the efficacy of metformin in menstrual regulation and body weight reduction in *polycystic ovary syndrome*.

Materials and methods

This cross sectional study was carried out at Combined Military Hospital (CMH) Chittagong from 2016 to 2018. 60 women with *polycystic ovary syndrome* were enrolled in the study. The clinical diagnosis of *polycystic ovary syndrome* was defined according to the consensus criteria for PCOS with the presence of clinical and biochemical signs of hyperandrogenism, chronic anovulation and/or oligomenorrhoea and polycystic ovaries. All received 1700 mg/day metformin as tablets uninterruptedly for 6 months. After editing and coding, the coded data were directly entered into the computer by using SPSS software, version 22.0. Data cleaning validation and analysis were performed using the SPSS software. Categorical data were presented as percentage and continuous variable were expressed as mean±SD (Standard Deviation).

1. Colonel & Specialist in Obstetrics & Gynaecology
Combined Military Hospital, Dhaka.

2. Brig Gen & Principal
Army Medical College Chattogram, Chattogram.

3. Assistant Professor Obstetrics & Gynaecology
Shaheed Tajuddin Ahmed Medical College, Dhaka.

*Correspondence: Colonel (Dr) Shamima Yasmin
Cell: +88 01769 01 46 27
Email: yasminshamima1047@gmail.com

Submitted on : 5th December 2021

Accepted on : 27th December 2021

Results

In Table I shows age distribution of the patients. Most of the patients belong to 21-23 years age group (60%). The following table is given below in detail:

Table I Age distribution of the patients

Age group	Percent
18-20 Years	20%
21-23 Years	60%
24-26 Years	10%

In table II shows demographic status of the patients. 41.7% patients just completed their secondary level of education followed 85% patients were unmarried. The following table is given below in detail:

Table II Demographic status of the patients

Demographic Status	Percentage (%)
Educational status	
Secondary	12.5%
SSC	41.7%
HSC	33.3%
Running student	12.5%
Marriage status	
Unmarried	85%
Married	15%

In Table III shows patient status and family history of the patients where 35% had family history of PCOS and 44% patient had obesity in past family history. Besides that, mean BMI was 26.17±5.62kg/m² where as mean Serum TSH, was 2.21±1.11 mIU/ml. The following table is given below in detail:

Clinical and family characteristics	(%) and mean±std
Family History	
PCOS:	35%
Obesity:	44%
Mean Serum TSH , mIU/ml	2.21±1.11
Mean S. prolactin, ng/ml	16.14±21.12
S. LH/FSH ratio	1.60±1.25
S. Total testosterone, ng/ml	8.11±3.98
Mean BMI, kg/m ²	26.17±5.62

In Figure-1 shows 89% patients had their menstrual cycle regular after metformin intervention. The following figure is given below in detail:

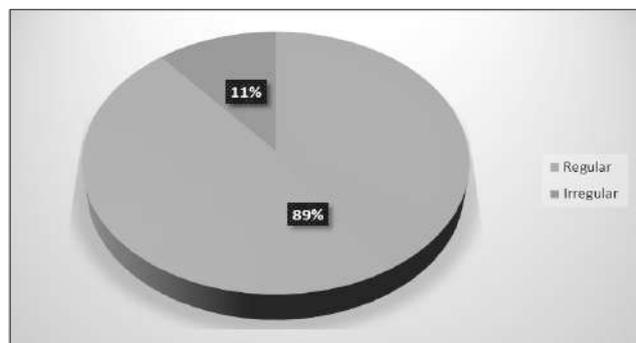


Figure 1 Menstrual cycle status after metformin intervention

In Table IV shows body weight and Serum progesterone manifestation after six months of metformin intervention. Before metformin intervention 49% cases were obese which was shifted to 25% after metformin intervention. Besides that, Serum progesterone level was improved into 5.16±5.20ng/ml. The following table is given below in detail:

Table IV Body weight and S. progesterone manifestation after six months of metformin intervention

Variable	Before metformin intervention	After metformin intervention	p value
BMI, kg/m ² (mean±SD)	26.17±5.62	22.17±5.50	0.001
BMI category, %			
Optimal	36%	21%	
Overweight	15%	54%	
Obese	49%	25%	
S. progesterone, ng/ml	1.54±2.50	5.16±5.20	0.002

In figure-2 shows complication after metformin intervention where loose motion seen in 55% cases, followed by vomiting in 35% cases and nausea seen in 40% cases. The following figure is given below in detail:

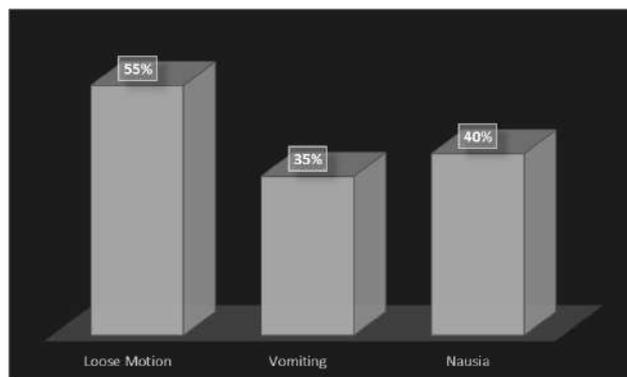


Figure 2 Complication after metformin intervention

Discussion

We observed that metformin with lifestyle modification led to the reduction of BMI. Most of the studies found similar results and few studies also found that metformin reduced insulin resistance even without reducing BMI, in *polycystic ovary syndrome*.⁸ We found that metformin, significantly reduced BMI especially in obese patients. A recently published systematic review and meta-analysis of Randomized Controlled Trials (RCTs) showed that metformin significantly reduced weight in *polycystic ovary syndrome* patients.⁹ In the present study, there was significant improvement of menstrual irregularity in both metformin groups. Therefore in the other study, it was not clearly possible to discriminate the impact of metformin on this issue as lifestyle modification was practiced by the participants of groups.¹⁰

In one study menstruating regularly significantly noticed where amenorrhea 11 (27.5%) and oligomenorrhoea 29(72.5%) was significantly improved by 6 (15%) & 16 (40%) respectively. Whereas in our case, 89% improvement of menstrual cycle was found in metformin group in several other studies.¹¹⁻¹³ At the end of study period, there was significant increase in progesterone level. Serum progesterone level was found 5.16 ± 5.20 ng/ml, where as other study serum progesterone level was 6.01 ± 4.20 ng/ml, which quite similar to our study.¹⁴

During the study after metformin intervention, loose motion was seen in 55% cases, followed by vomiting in 35% cases and nausea was seen in 40% cases. Other study reported that loose motion was seen in 45% cases, followed by vomiting in 31% cases, nausea was seen in 49% cases and abdominal pain in 32% cases.¹³ Which is quite similar to our study.

Conclusion

The present results confirm the positive effects of metformin on menstrual periods and show that the drug can be administered to young women to improve ovulation and hyperandrogenic symptoms like weight gain.

Disclosure

Both the authors declared no competing interests.

References

- Adams J, Polson DW and Franks S. Prevalence of polycystic ovaries in women with anovulation and idiopathic hirsutism. *Br Med. J.* 1986;293:355–359.
- Anderson P, Seljeflot I, Abdelnoor M, Arnesen H, Dale PO, Lovik A and Bir-kealand K. Increased insulin sensitivity and fibrinolytic capacity after dietary intervention in obese women with polycystic ovary syndrome. *Metabolism.* 1995; 44(5):611–616.
- Apter D, Bützow T, Laughlin A and Yen SS. Metabolic features of polycystic ovary syndrome are found in adolescent girls with hyperandrogenism. *J Clin Endocrinol Metab.* 1995;80:2966–2973.
- Arslanian SA, Lewy V, Danadian K and Saad R. Metformin therapy in obese adolescents with polycystic ovary syndrome and impaired glucose tolerance: Amelioration of exaggerated adrenal response to adrenocorticotropin with reduction of insulinemia/insulin resistance. *J Clin Endocrinol Metab.* 2002;87:1555-1559.
- Chang JR, Nakamura RM, Judd HL and Kaplan SA. Insulin resistance in nonobese patients with polycystic ovarian disease. *J Clin Endocrinol Metab.* 1983; 57:356–359.
- Shafiee MN, Malik DA, Yunos RI, Atiomo W, Omar MH, Ghani NA, Hatta AZ, Seedhouse C, Chapman C, Mokhtar NM. The effect of Metformin on endometrial tumor-regulatory genes and systemic metabolic parameters in polycystic ovarian syndrome : A proof-of-concept study. *Gynecological Endocrinology.* 2015;;31(4):286-290.
- Nabi MM, Pathan MF, Barua M, Kabir MM, Alam MJ, Jannat KM. Clinical and biochemical outcome of patients with polycystic ovary syndrome managed with life style modification or combination with metformin. *BIRDEM Medical Journal.* 2020;10(1):26-33.
- Akhter N, Hasnat MA, Banu H, Tuqan S, Mustari M, Sultana T, Fariduddin M. Effect of Metformin Therapy over Hormone Profiles in Newly Diagnosed Polycystic Ovary Syndrome- A Nine Months Randomized Controlled Trial. *ARJE;* 2016; V1:1-9.
- Nahar, K, Yasmin H, Pramanik, L. Study of Polycystic Ovaries in Mymensingh Medical College Hospital, Bangladesh. *Journal of Bangladesh College of Physicians & Surgeons.* 2014;32(3):142-144.
- Lord JM, Flight IH, Norman RJ. Metformin in polycystic ovary syndrome: Systematic review and meta-analysis. *BMJ.* 2003;327(7421):951-953.
- Ibanez L, Valls C, Potau N, Marcos MV and De Zegher F. Sensitization to insulin in adolescent girls to normalize hirsutism, hyperandrogenism, oligomenorrhea, dyslipidemia, and hyperinsulinism after precocious pubarche. *Am J Obstet Gynecol.* 2000;140,815–826.
- Ibanez L, Valls C, Ferrer A, Marcos MV, Rodriguez-Hierro F and de Zegher F. Sensitization to insulin induces ovulation in nonobese adolescents with anovulatory hyperandrogenism. *J Clin Endocrinol Metab.* 2001; 85:3526–3530.
- Moggetti P, Castello R, Negri C, Tosi F, Perrone F, Caputo M et al. Metformin effects on clinical features, endocrine and metabolic profiles and insulin sensitivity in polycystic ovary syndrome: A randomized, double-blind, placebo-controlled 6-month trial, followed by open, long-term clinical evaluation. *J. Clin. Endocrinol. Metab.* 2000; 85(1): 139–146.
- La Marca A, Egbe TO, Morgante G, Paglia T, Cianci A and De Leo V. Metformin treatment reduces ovarian cytochrome P-450c17 α response to human chorionic gonadotrophin in women with insulin resistance-related polycystic ovary syndrome. 2000.

Effects of Sildenafil on Six Minute Walk Distance and Pulmonary Hypertension Associated with Chronic Obstructive Pulmonary Disease: Randomized Control Trial

Kazi Mohammed Towhidul Alam¹ A S M Zahed² Misbahus Saleheen³
Jaber Abedin⁴ Rajat Sanker Roy Biswas^{5*}

ABSTRACT

Background: Pulmonary Hypertension (PH) is a serious complication of Chronic Obstructive Pulmonary Disease (COPD). Sildenafil, a phosphodiesterase-5 inhibitors has found to improve exercise capacity and hemodynamic parameters in patients with idiopathic pulmonary arterial hypertension. However, whether such beneficial effects take place in selected population of COPD remains uncertain. Aim of the study was to evaluate the effects of Sildenafil on exercise capacity and change in pulmonary arterial pressure in patients with COPD with PH.

Materials and methods: This open, randomized clinical trial was carried out in the Medicine Department of Chittagong Medical College Hospital. One hundred and ten patients of 40-80 years of age with severe COPD and mild to moderate PH were randomly assigned into two groups. 55 patients in each group received either sildenafil 25mg three times daily with conventional treatment of COPD (Group A) or conventional treatment of COPD without sildenafil (Group B). The treatment duration was 12 weeks. Distance covered in six-Minute Walk Distance Test (6MWD) and Pulmonary Arterial Pressure (PAP) was measured at baseline and after 12 weeks.

Results: In respect to demographic characteristics and baseline clinical findings there was no statistically significant difference between two groups. Effective sample size was 82 (39 in the Group A and 43 in Group B) as because 24 patients were failed to complete all post-randomization procedures. Change from baseline in 6MWD (Mean distance covered in 6 minutes after 12 weeks in group A and group B were 288.23 and 290.48 meters respectively) and PAP (Mean PAP after 12 weeks in group A and group B were 42.44 and 43.38 mmHG respectively) was not significant in both groups. 17.9% patient of group A and 13.9% patient of group B were COPD exacerbation. Headache, flushing, dyspepsia and nasal congestion were found more frequent in sildenafil group, but was mild in all patients.

Conclusion: Sildenafil does not increase the exercise capacity and not decrease the PAP in patients with COPD with mild to moderate PH.

Key words : COPD; PH; Sildenafil; 6MWD.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of mortality and morbidity worldwide. Pulmonary vascular disease happens early in the natural history of COPD, when pulmonary vascular changes have been reported in cigarette smokers with normal spirometry values.¹

Activity limitation and dyspnoea are the primary symptoms of COPD and progress as the disease advances, contributing to reduced quality of life.² Various factors, such as ventilation perfusion mismatch, skeletal muscle abnormality as a result of systemic inflammatory condition, right ventricular overload for pulmonary vascular changes and simple de-conditioning of right heart, can result in reduced exercise capacity in patients with COPD.³ Pulmonary arterial hypertension (PAH) is a common complication during the course of COPD and is an important predictor of mortality.⁴

Endothelial dysfunction of pulmonary arteries is at the origin of PAH in COPD.⁵ It results from changes in the synthesis and balanced release of endothelium-derived mediators with vasodilator or vasoconstrictive properties.⁵ Nitric Oxide (NO) is the main endogenous vasodilator synthesized by the endothelium.⁶ Endothelial dysfunction of pulmonary arteries is at the origin of PAH in COPD.⁵ It results from changes in the synthesis and balanced release of endothelium-derived mediators with vasodilator or vasoconstrictive properties.⁵ Nitric Oxide (NO) is the main endogenous vasodilator synthesized by the endothelium.⁶ Drugs that modulate the endothelium-derived vasoactive

1. Assistant Professor of Medicine
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
2. Associate Professor of Medicine
Chittagong Medical College, Chattogram.
3. Medical Officer
Roufabad Urban Dispensary, Chattogram.
4. Lecturer of Pharmacology
Chittagong Medical College, Chattogram.
5. Associate Professor of Medicine
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.

*Correspondence: **Dr. Rajat Sanker Roy Biswas**
Cell: +88 01819 80 84 33
Email: rajatbiswas76@yahoo.com

Submitted on : 20th October 2021
Accepted on : 29th November 2021

mediator imbalance confirm the current strategy for the treatment of severe forms of PAH.⁷ Sildenafil, a Phosphodiesterase-5 inhibitor, enhances the vasodilator and antiremodeling effects of endogenous NO.⁶ In patients with PAH, sildenafil reduces pulmonary vascular resistance, increases exercise tolerance and has beneficial effects on survival.⁸ Considering that in COPD, the endogenous synthesis and availability of NO are impaired.^{5,8} It is conceivable that sildenafil might be of clinical benefit in patients with COPD associated PAH. However, in the case of COPD, one major limitation of agents with vasodilator properties, such as sildenafil, is their potential risk of gas exchange impairment, due to hypoxic vasoconstriction inhibition. Indeed, sildenafil inhibits hypoxic vasoconstriction in healthy subjects.⁹ Accordingly, the effects of sildenafil on pulmonary hemodynamics and gas exchange should be carefully evaluated in COPD before considering the assessment of its long-term efficacy.¹⁰

Long-term administration of sildenafil has been shown to improve exercise capacity, dyspnoea and haemodynamics in patients with symptomatic PAH.¹¹ In a preliminary report of six patients of COPD was shown that sildenafil improved 6MWD and haemodynamic parameters.¹² However, in a recent study, sildenafil failed to improve stroke volume and 6MWD in patients of COPD with and without PAH.¹³

Materials and methods

This study was an open-label randomized controlled trial carried out in Department of Medicine, Chittagong Medical College Hospital (CMCH) from 1/6/2017 to 30/06/2018. All patients of both sexes between 40 to 80 years of age was admitted in medicine ward of CMCH with a diagnosis of COPD and had pulmonary hypertension. The study included the following two groups: Group-A: (Intervention group) received Sildenafil plus standard conventional treatment of COPD. GroupB: (Control group) received only the standard conventional treatment of COPD. Inclusion criteria were Ambulatory patients with severe or very severe COPD (FEV1/FVC<0.7% and FEV1<50% of predicted) according to Global Initiative for Chronic Obstructive Lung Disease (COLD) classification, had estimated pulmonary artery systolic pressure of more than 40mmHg as measured by Doppler echocardiography. Man and woman age between 40 to 80 years and stable medical regimen for 30 days prior to enrolment were included. Patients were not included had: History of bronchial asthma and Asthma COPD Overlap Syndrome (ACOS), history of primary cardiac disease or documented ischaemic heart disease, use of nitrates or other vasodilator throughout the study period, evidence of PAH due to any other cause, such as pulmonary thromboembolism, Human Immunodeficiency Virus (HIV), scleroderma, congenital heart disease and decompensated right or left heart failure, DPLD, thromboembolic disorder, pulmonary vascular

disease, left ventricular ejection fraction <45% by echocardiography, Pregnancy or current breast feeding and patients refused to participate. Sample size of 55 subjects per group is needed to test the hypothesis were drawn by sample size calculation equation.

Consecutive patients were selected purposively as per inclusion and exclusion criteria. Eligible patients were randomly allocated in two groups-

For Group A: Patients of Group A received oral sildenafil (Tablet. Vigorex, Square pharmaceutical LTD, Bangladesh) in the dosage of 25mg three times a day for 12 weeks along with the conventional treatment of COPD.

For Group B: Patients of Group B received only the conventional treatment of COPD for 12 weeks.

Results

Table I Socio-demographic characteristics of the study population by groups

Characteristics	Group A Sildenafil (n=39)	Group B Without Sildenafil (n=43)	p value
Age, in years			
Mean ±SD	60.35 ±6.48	61.63 ±5.9	0.359*
Median (Range)	61 (49-78)	60 (45-76)	
Sex			
Male	38 (97.4%)	41 (95.3%)	0.615 [†]
Female	1 (2.6%)	2 (4.7%)	
Educational level			
Illiterate	28 (71.8%)	25 (58.2%)	
Primary	6 (15.4%)	10 (23.3%)	
SSC	4 (10.2%)	5 (11.6%)	0.142 [†]
HSC	1 (2.6%)	3 (6.9%)	
Occupation			
House maker	1 (2.6%)	2 (4.7%)	
Day labour	10 (25.6%)	14 (32.6%)	0.468 [†]
Business	10 (25.6%)	11 (25.6%)	
Farming	18 (46.2%)	16 (37.1%)	
Monthly family income, in Tk			
Mean ±SD	15831±4051	14253±5061	0.876*
Median (Range)	7000-20000	7500-20000	

Continuous data are presented either in Mean±SD or Median (Range) and categorical data in frequency and percentage. *p value derived from independent sample t test and not significant; [†]p value derived from Chi-square test and not significant.

Socio-demographic characteristics of the study population are described in Table I. It showed that, mean age of the intervention group was 60.35 ±6.48 years and in control group 61.63 ±5.9 years and male predominance in both groups. These differences were not statistically significant. Similar to age and sex with respect to educational level, occupation and monthly family income the groups were also comparable.

Table II Comorbid conditions and risk factors distribution by groups

Characteristics	Group A Sildenafil (n=39)		Group B Without sildenafil (n=43)		p value
	n	%	n	%	
Comorbid conditions					
H/O DM	6	(7.4%)	9	(6.9%)	.098 [†]
H/O HTN	8	(22.5%)	13	(26.2%)	.067 [†]
Smoking status					
Current smoker	6	(15.4%)	6	(13.9%)	
Ex smoker	32	(82.1%)	35	(81.4%)	.988 [†]
Non smoker	1	(2.5%)	2	(4.7%)	
Pack year history					
in smoker	23.3±14.45		25.5 ±12.56		.078*
Biomass exposure					
Yes	1	(2.5%)	2	(4.7%)	0.051 [†]

Data are presented either in Mean±SD or in frequency and percentage. *p value derived from independent sample t test and not significant, †p value derived from Chi-square test and not significant.

HTN and DM were the common comorbid conditions in both groups. 7.4% of group A and 6.9% of group B patients had history of DM and 22.5% of group A and 26.2% of group B patients had history of HTN. Most of the study participants were either ex or current smokers. However, with respect to presence of comorbid conditions, smoking status and H/O biomass exposure both the groups were comparable.

Table III Change in distance covered in 6MWD test in both groups after 12 weeks of treatment

Group	6 MWD in meter						p value
	Baseline		After 12 weeks				
	Mean	SD	Mean	SD	Median	Median	
Group A (n=39)	281.9	±109.9	210	288.23	111.45	220	0.556*
Group B (n=43)	284.6	±122.5	213	290.48	115.88	217	0.74*

*p value derived from paired sample t test and not significant.

To assess the improvement of exercise capacity after 12 weeks of treatment, distances covered in 6 minutes by the patients before and after 12 weeks of treatment were compared in both groups. There was no significance change in 6 MWD in either of the two groups.

Table IV Change in pulmonary artery pressure (PAP) in both groups after 12 weeks of treatment

Group	Pulmonary arterial pressure, in mmHg				p value
	Baseline		After 12 weeks		
	Mean	SD	Mean	SD	
Group A (n=39)	45.35	3.9	42.44	4.1	0.556*
Group B(n=43)	44.89	3.8	43.38	4.7	0.74*

*p value derived from paired sample t test and not significant.

Besides 6MWD, PAP was also measured at baseline and after 12 weeks of therapy. There was no significant change in PAP values from baseline among the study subjects irrespective of the assigned group .

Table V Changes in oxygen saturation after 6MWD test at baseline and after 12 weeks of treatment in both groups

Oxygen saturation	Group A (n=39) Sildenafil		Group B (n=43) without sildenafil		p value
	Mean	SD	Mean	SD	
Baseline					
Before test	95.9	3.01	96.2	3.8	0.683*
After test	93.6	2.5	94.4	2.09	0.719*
Change during test	-2.34	0.98	-2.98	0.78	0.736*
After 12 weeks					
Before test	95.01	4.03	96.1	3.56	0.891*
After test	92.8	3.53	95.45	3.45	0.781*
Change during test	-3.56	1.23	-1.20	2.23	0.756*

*p value derived from independent sample t test and not significant.

Oxygen saturation was measured before and after the 6MWT. There was no significance difference in oxygen saturation between the groups at any point

Table VI Reported clinical adverse events and incidence of different types of exacerbations

Adverse events	Group A (n=39) Sildenafil		Group B (43) Without sildenafil		p value
	n	%	n	%	
COPD exacerbation	7	17.9	6	13.9	0.623*
Headache	6	15.4	4	10.3	0.916*
Dizziness	5	12.8	2	5.1	0.816*
Dyspepsia	5	12.8	3	7.7	0.875*
Nasal congestion	3	7.7	1	2.6	0.127*
Flushing	3	7.7	0	0	0.084*
Redness of the skin	1	2.7	0	0	1.0*
Unusual weakness	1	2.7	1	2.6	1.0*
Pain/tenderness around eye & check bone					
Piraprsim	1	2.7	0	0	1.0*
	0	0	0	0	

*Not significant by fisher exact test.

Adverse events were similar in both groups during the intervention period. Common adverse events were headache, dizziness, dyspepsia, nasal congestion and flushing (Table VI).

Discussion

110 patients of COPD with PAH in two groups were enrolled. Group-A received 25 mg sildenafil three times daily along with the standard treatment of COPD and group-B received only the standard treatment and no sildenafil. Change in pulmonary arterial pressure and 6 MWD from baseline to 12 weeks of treatment were assessed. Twenty eight patients (16 patients in Group-A and 12 patients in Group-B) failed to complete the study. So effective sample size was 82 (Group A=39 patients and Group B=43 patients).

Mean age of the study population was 60.98 ± 6.13 years with a range of 45-78 years. This age range of COPD patients was similar to other study carried out in Bangladesh. Kabiret al conducted a study to determine the scenario of COPD in Dhaka city Bangladesh in 2016.^{14,15} Most of the COPD patients were within the age of 46-75 years and 98.0% of them were male. In the present study 96.34% were male patients.

Regarding educational level and monthly family income most of our study populations were illiterate and had comparatively lower monthly family income. These findings were in agreement with that of Matthew et al.¹⁶ They examined the association between socio-economic status and COPD prevalence using data collected in Argentina, Bangladesh, Chile, Peru, and Uruguay. In that analysis of multiple population-based studies, lower education, lower household income, and lower composite SES index were associated with COPD.

The present study failed to show any significant improvement in the exercise capacity as measured by 6MWD test and reduction of PAP measured by echocardiography after giving sildenafil 25mg three times daily for 12 weeks. The increase in exercise capacity, assessed by the 6 MWT as the primary end-point, was similar in the sildenafil and control groups. Similarly, the improvements obtained in patients treated with sildenafil in PAP did not differ from those of the control group. Overall, these results showed that in patients with COPD and increased PAP on echocardiography, the addition of sildenafil did not enhance the results already obtained with regular standard COPD treatment. The findings were consistent with the work of Blanco and colleague and Rietemaet al^{17,18}.

In contrast to this study, Madden et al found positive effect of sildenafil in the management of pulmonary hypertension in patients with COPD. In their study, the pulmonary vascular resistance was reduced in six patients. Six-minute walk test increased in six patients. 2D echocardiography showed a reduction in estimated PAP in six patients with an improvement in right ventricular systolic function in two COPD patients¹⁹.

Rao et al in their double blind placebo-controlled randomized trial on 15 patients with severe COPD, a three months course of oral sildenafil 20 mg 8 hourly improved 6MWD and reduced PAP.²⁰

In patient with COPD and associated pulmonary hypertension, sildenafil decreased pulmonary vascular resistance both at rest and during exercise. In the present study this effect was not reflected in increased exercise capacity and reduction of PAP. The lack of improvement in this group of patients with severe-to-very-severe airflow obstruction and mild-to-moderate pulmonary hypertension could be explained by the overwhelming effect of ventilatory impairment on exercise limitation, which would blunt the potential haemodynamic benefit obtained with sildenafil.²¹ In a study on ventilatory and cardiocirculatory exercise profiles in COPD found that patients with severe PH showed an exhausted circulatory reserve at the end of exercise.²¹

Limitations

The study has some limitations:

- i) PAP was estimated by Doppler electrocardiography. Therefore, a definite diagnosis of pulmonary hypertension could not be established in these cases.
- ii) This study used a sildenafil dose of 25 mg three times daily. Since sildenafil may exert greater haemodynamic effects at higher doses, we could not rule out the higher sildenafil doses would have exerted a different effect on exercise tolerance.
- iii) Nearly all of the patients included in the study were male. Therefore, the current findings may not be applicable to females.
- iv) It was a single center study with relatively small sample size.
- v) As it was an open label study and assessment was done by the investigator himself there was a great chance of observer bias.
- vi) Follow-up period was relatively short.

Conclusions

The present, randomized controlled trial, conducted in patients with COPD and increased PAP, failed to meet the primary end-point that sildenafil combined with regular standard treatment would provide further gain in exercise tolerance. As patients had only moderately increased PAP, it was not possible to extrapolate the present results to patients with severe pulmonary hypertension. Therefore, sildenafil should not be recommended to improve exercise capacity in patients with advanced COPD and mild-to-moderate pulmonary hypertension.

Recommendations

This study results do not support routine clinical use of sildenafil for treatment of COPD with mild to moderate pulmonary hypertension. Future studies should focus on the effects of sildenafil in patients with COAD with severe pulmonary hypertension with a double blind, placebo-controlled randomized design which should be appropriately powered to definitely determine its safety and efficacy.

Disclosure

All the authors declared no competing interests.

References

1. Santos, S., Peinado, V.I., Ramirez, J., Melgosa, T., Roca, J., Rodriguez-Roisin, R et al. Characterization of pulmonary vascular remodelling in smokers and patients with mild COPD. *EurRespir J.* 2002;19(4):632-638.
2. Brown, C.D., Benditt, J.O., Sciruba, F.C., Lee, S.H., Crineq, G.J., Morenifar, Z et al. Exercise testing in severe emphysema: Association with quality of life and lung function. *COPD.* 2008;5(2):117-124.

3. Macintyre, N.R. Mechanism of functional loss in patients with chronic lung disease. *Respir Care*. 2008;53(9):177-184.
4. Weitzenblum, E., Hirth, C., Ducolone, A., Mirhom, R., Rasaholinjanahary, J., Ehrhart, M. Prognostic value of pulmonary artery pressure in chronic obstructive pulmonary disease. *Thorax*. 1981;36(10):752-758.
5. Peinado, V.I., Pizarro, S., Barbera, J.A. Pulmonary vascular involvement in COPD. *Chest*. 2008;134(4):808-814.
6. Ghofrani, H.A., Pepke-Zaba, J., Barbera, J.A., Channick, R., Keogh, A.M., Gomez-Sanchez, M.A. Nitric oxide pathway and phosphodiesterase inhibitors in pulmonary arterial hypertension. *J Am College of Cardiology*. 2004;16(43):68S-72S.
7. Barbera, J.A., Roman, A., Gómez-Sánchez, M.Á., Blanco, I., Otero, R. López-Reyes, R. et al. Guidelines on the Diagnosis and Treatment of Pulmonary Hypertension: Summary of Recommendations *Arch Bronconeumol*. 2018;54(4):205-215.
8. Galie, N., Ghofrani, H.A., Torbicki, A., Barst, R.J., Rubin, L.J., Badesch, D et al. Sildenafil citrate therapy for pulmonary arterial hypertension. *N Engl J Med*. 2005;353: 2148-2157.
9. Zhao, L., Mason, N.A., Morrell, N.W., Kojonazarov, B., Sadykov, A., Maripov, A et al. Sildenafil inhibits hypoxia induced pulmonary hypertension. *Circulation*. 2001;104(4):424-428.
10. Hoper, M. M., Barbera, J.A., Channick, R.N., Hassoun, P.M., Lang, I.M., Manes, A et al. Diagnosis, assessment and treatment of pulmonary arterial hypertension. *J Am College of Cardiology*. 2009;54:85-96.
11. Alp, S., Skrygan, M., Schmidt, W.E., Bastian, A. Sildenafil improves hemodynamic parameters in COPD: An investigation of six patients. *Pulmonary Pharmacology and Therapeutics*. 2006;19(6):386-390.
12. Rietema, H., Holverda, S., Bogaard, H.J., Marcus, J.J., Smit, H.T., Westerhof, N et al. Sildenafil treatment in COPD does not affect stroke volume or exercise capacity. *EurRespir J*. 2008;31(4):759-764.
13. Park, J., Song, J.H., Park, D.A., Lee, J.S., Lee, S.D., Oh, Y.M. Systematic Review and Meta-Analysis of Pulmonary Hypertension Specific Therapy for Exercise Capacity in Chronic Obstructive Pulmonary Disease. *J Korean Med Sci*. 2013;28(8):1200-1206.
14. Prins, K.W., Duval, S., Markowitz, J., Pritzker, M., Thenappan, T. Chronic use of PAH-specific therapy in World Health Organization Group III Pulmonary Hypertension: A systematic review and meta-analysis. *Pulmonary Circulation*. 2017;7(1):145-155.
15. Kabir, M., Tanvir, H., Rahman, M., Abdur, M. The scenario of COPD in Dhaka city Bangladesh: Extensive analysis of the prevalence, manifestations and standards of diagnosis and treatment. *International Journal of Research in Pharmacology & Pharmacotherapeutics*. 2016;5(2):192-198.
16. Matthay, R.A., Schwarz, M.I., Ellis, J.H. Pulmonary artery hypertension in chronic obstructive pulmonary disease: Determination by chest radiography. *Investigative Radiology*. 1981;16(2):95-100.
17. Blanco, I., Santos, S., Gea, J., Güell, R., Torres, F., Gimeno-Santos, E., et al. Sildenafil to improve respiratory rehabilitation outcomes in COPD: A controlled trial. *EurRespir J*. 2013;42(4):982-992.
18. Redelmeier, D.A., Bayoumi, A.M., Goldstein, R.S., Guyatt, G.H. Interpreting small differences in functional status: The Six Minute Walk test in chronic lung disease patients. *Am J Respir Crit Care Med*. 1997; 155(4):1278-1282.
19. Madden BP, Allenby M, Loke TK, Sheth, A. A potential role for sildenafil in the management of pulmonary hypertension in patients with parenchymal lung disease. *Vascul Pharmacology*. 2006;44(5):372-376.
20. Rao, R.S., Singh, S., Sharma, B.B., Agarwal, V.V., Singh, V. Sildenafil improves six minute walk distance in chronic obstructive pulmonary disease: A randomised, double-blind, placebo-controlled trial. *Indian J Chest Dis Allied Sci*. 2011;53(2):81-85.
21. Boerrigte, B.G., Bogaard, H.J., Trip, P., Groepenhoff, H., Rietema, H., Holverda, S., et al. Ventilatory and cardiocirculatory exercise profiles in COPD: The role of pulmonary hypertension. *Chest*. 2012;142(5):1166-1174.

Clinicohaematological Profile and Outcome of Falciparum Malaria in Hospitalized Children : A Prospective Study

Dazy Barua¹ Tanuka Barua² Rupam Talukder^{3*} Mitra Datta¹
Pranab Kumar Barua⁴ Javed Bin Amin¹

ABSTRACT

Background: Malaria is a mosquito borne disease causing fatality among the infected persons. Objective of the present study was to see the clinicopathological features and outcome of plasmodium falciperum induced malaria in a tertiary care center of Bangladesh.

Materials and methods: It was an cross sectional observational study done in a tertiary care center in a six months study period among 60 cases of confirmed falciperum malaria patients. Data was collected after informed written consent and clinicopathological features and outcome were recorded. Data was compiled and analyzed by Microsoft Excel.

Results: Among the 60 cases, 7(11.67%) were below 1 year, 22(36.66%) within 1 – 4 years, 10(16.67%) within 5 – 8 years and 21(35.0%) within 9 – 12 years. 1 (50.17%) were male and 29 (49.83%) were female. Among all, 8 (13.33%) patients were found in January, 12(20%) in February, 9 (15%) in March, 13 (21.67%) in April and 18 (30.0%) patients were found in May. Regarding major clinical symptoms, fever was present in 60 (100.0%) cases, vomiting in 49 (81.67%), cough in 16 (26.67%), weakness in 12 (20%), diarrhoea in 8 (13.33%), altered consciousness in 9 (15.0%), respiratory distress in 6 (10.0%), dark urine 2 (3.33%) and Oliguria in 1 (1.67%) cases. Among the uncomplicated falciparum malaria patients, all (100.0%) had rise of temperature, dehydration was in 7 (63.63%) cases, pallor in 6 (54.56%) cases, only hepatomegaly in 4 (36.37%) cases, only splenomegaly in 3 (27.28%) cases, hepatosplenomegaly in 2 (18.18%) cases, and jaundice in 2 (18.18%) cases. Among the studied cases 49 cases developed complications out of which 21 (42.86%) cases had diarrhoea, 15 (30.62%) cases had Cerebral malaria, 7 (14.28%) cases pulmonary oedema, 4 (8.16%) cases black water fever without renal failure and 2 (4.08%) cases black water fever without renal failure. Among 15 patients of cerebral malaria, 8 (53.33%) cases had Blantyre coma score 3 or more than 3, 4 (26.67%) cases had score less than 3, positive Babinski's sign was seen in 8 (53.33%) cases, Brisk tendon reflex in 8 (53.33%) cases, convulsion in 6 (40.0%) cases, Pulmonary oedema in 4 (26.67%) cases, Abolished tendon reflex in 4 (26.67%) cases, constricted pupils in 4 (26.67%) cases, nuchal stiffness in 2 (13.33%) cases and Kernig's sign in 2 (13.33%) cases. Evidences of haemolysis in 10 (100%), out of which clinical jaundice was in 2 (20%) cases, severe anaemia in 6 (60%) cases, hyperbilirubinaemia in 5 (50%) cases, hyperurobilinogen in 10 (100%) cases, reticulocytosis in 6 (60%) cases. Initial treatment of falciparum of studied cases was with chloroquine in 6 (10%) cases and with quinine in 54 (90%). Parasitemia disappeared in 4 (66.67%) with 3 days chloroquine therapy. In the remaining 2 cases parasitemia were persisting even after choloquine therapy for 3 days and they were subsequently treated with oral Quinine therapy. Parasitemia began to disappear in 2nd day after starting treatment with quinine and completely disappeared in all cases 7 day after starting treatment with quinine. Regarding outcome 58 (96.67%) patients survived and 2 (3.33%) patients lepired. 1 (1.67%) case died of cerebral malaria and 1 (1.67%) case died of Blackwater fever with renal failure. Among the survivors none was found to have residual changes.

Conclusions: Malaria is a fatal disease if kept untreated and proper preventive measures should be taken to overcome it.

Key words : Children; Chloroquine; Falciparum malaria; Hill tracts; Mosquito.

1. Assistant Professor of Paediatrics
Chittagong Medical College, Chattogram.
2. Associate Professor of Paediatrics
Chattogram Ma-O-Shishu Hospital Medical College, Chattogram.
3. Assistant Professor of Paediatric Surgery
Cox's Bazar Medical College, Cox's Bazar.
4. Assistant Professor of Paediatrics
Bangladesh Institute of Tropical and Infectious Disease (BITID) Chattogram.

*Correspondence: **Dr. Rupam Talukder**
Cell: +88 01819 51 49 11
Email: rupamtalukder1969@gmail.com

Submitted on : 30th November 2021

Accepted on : 26th December 2021

Introduction

Malaria is a substantial public health problem in Bangladesh. Up to 400,000 clinical cases and more than 57,000 laboratory confirmed malaria cases with more than 500 deaths per year have been reported from Bangladesh. Thirteen out of the 64 districts in the are seriously affected by malaria, accounting for bulk of the laboratory confirmed cases especially occurring in the Chittagong Hill Tracts. There are too many investigations for diagnosing malaria. Newer techniques of higher diagnostic accuracy for P. falciparum include Enzyme-Linked Immunosorbent Assay (ELISA) DNA hybridization and Polymerase Chain Reaction (PCR).¹

However due to the lack of financial resources and the resulting shortcomings in malaria research, surveillance and control, the disease burden may be far greater than reported. Most affected of these districts are home to populations and minorities living on the remote hill tract areas and the adjoining districts of the southeast, east and northeast border of the country. Despite past successes in malaria control, a significant increase in malaria cases and Plasmodium falciparum infection has been seen over the years. Indeed, the vast majority of parasite populations may be resistant to chloroquine. However, chloroquine remains the most common treatment for malaria control lack of data on the current drug resistance patterns, as well as the lack of research into affordable alternative treatments.²

In prehistoric time people were known to suffer and die from malaria. In Bangladesh 1960, pre eradication survey on the infant and children was carried out by estimation of spleen rate and blood parasite which revealed that malaria was hyperendemic in eastern border districts of Chittagong Hill Tracts and western border district of Dinajpur, Khustia. It was mesoendemic in the Rajshahi and northern border district of Rangpur and Mymensingh. In all other districts, malaria was hypoendemic.³

Malaria, the ancient disease is still taking toll in many tropical countries of the world including Bangladesh. It remains one of the world's major health problems, causing fatalities, chronic ill-health and decreased productivity in many parts of Africa, Southern Asia and the Western Pacific. It is a global health problem which affects more than 40 percent of the population in 143 countries. Over 300 million of new malaria cases are added every year.⁴ It kills more than one million people worldwide each year and of these more than 15 – 25% are under 5 children. In South East Asia 9 countries out of 11, including Bangladesh are facing malaria health problems seriously. Main Victims are children and pregnant women. They are 75% of the total affected people.⁵

The Malaria areas of Bangladesh are along its eastern border with about 3.5 million people high risk. There was about 378,000 reported clinical cases and about 60,000 laboratory confirmed cases with 528 deaths in 1998. In a study, malaria cases are 40.5 per 10,000 people. Malaria related mortality rate in all ages is 1 per 100,000 and malaria related mortality rate in children aged 0-4 is 1 per 100,000. Malaria is the 6th leading cause of death in Bangladesh as 1389 deaths out 152,729 were caused by of malaria. Over all mortality rate is 20 – 25%. During the peak transmission months just prior to and after the rainy season, a 20% increase occur in the number of cases. Malaria is a known cause of febrile illness in the area of Bangladesh for a long period.^{6,7}

Human infection begins with bite of an infected female Anopheles mosquito and occurs in the liver and red cells. Infection present as recurrent and persistent infection. Transmission also follows transfusion of infected blood as well as congenital malaria which effects baby of infected mother through placenta, specially in primigravidae.

Young children living in the same endemic area, pregnant women especially primigravidae are more susceptible perhaps because of diminished immunity. Children upto six months are protected by passive immunity from the mother through the placenta. At the same time H6-F in new iron blood protects from malarial infection. In study of young children malaria complicated as hypoglycemia, severe anaemia, neurological sequelae, unconsciousness.⁸⁻⁹

Moreover, it is seen that many children are coming with unusual presentation like vomiting, headache, altered consciousness, convulsion, jaundice, diarrhea etc along with fever. These cases remain undiagnosed in the first instance. However, when the classical treatment fails, then we may look for malaria parasite in the blood. This is increasing the suffering in these unfortunate children. So, it is necessity to see the clinical presentations, response to anti malarial therapy and its prognosis in children. This study will help to identify the atypical signs and symptoms like fever with headache, bodyache, joint pain, dizziness, altered sensorium, hepatosplenomegaly etc of falciparum malaria especially in the children of endemic zone and effective quinine therapy ultimately reducing unwanted morbidity and mortality from severity of falciparum malaria.¹⁰

Materials and methods

It was a hospital based cross sectional variety of descriptive observational study done in the Pediatric Unit of Ward-09 in the Chittagong Medical College Hospital, Chittagong duration of which was 1st January to 31st May, 2009. Sample size was 60 cases. Inclusion criterias were children diagnosed and hospitalized as falciparum malaria and confirmed by blood slide in Chittagong Medical College Hospital, age – children below 12 years, sex – both male and female. Criteria for clinical diagnosis: presence of fever with one more of the following- Altered consciousness, Hyperpyrexia, Convulsion, Hypoglycemia, Severe anaemia, Acute pulmonary oedema, Acute renal failure, Metabolic acidosis, Jaundice (Clinical), Haemoglobinuria, Abnormal bleeding, Severe prostration, Severe vomiting, Shock Exclusion criteria were children clinically diagnosed as severe malaria but P. falciparum not confirmed by blood slide, children diagnosed falciparum malaria but referred from other hospital with 1st dose of quinine. Data collection was based on 60 cases of paediatric patients admitted with fever along with variable

atypical presentation of falciparum malaria like headache, bodyache, joint pain, dizziness, altered sensorium, hepatosplenomegaly etc. Falciparum malaria was confirmed by blood slide. Appropriate therapy was initiated and its outcome was noted. Though this study depends on limited no of patients and it will not reflect exactly the real situation it will enlighten the awareness among the paediatrician about atypical clinical and haematological profile and outcome of falciparum malaria in children and it is required for early diagnosis and treatment to reduce unwanted fatality from falciparum malaria. Data were collected with the help of a predetermined questionnaire attached herewith. All study data were captured on a structured case report from bearing subject demographic and identification number. All forms were reviewed before being double entered onto a computer. Statistical analyses was carried out with Epi info 6.04 (ENSP-Epiconcept-In VS, Corp.) and stata statistical software. A p-value of ≤ 0.05 was considered statistically significant. For this study, written approval was taken from the director of Chittagong Medical College Hospital. The aims and objectives of this study along with its procedure and benefits of this study were explained to the parents of the children in details in easily understandable language. Informed verbal consent from the parents was taken.

Results

Among 60 cases, 7(11.67%) below 1 year, 22(36.66%) within 1 – 4 years, 10(16.67%) within 5 – 8 years and 21(35.0%) within 9 – 12 years, 31 (50.17%) were male and 29 (48.83%) were female. Again, 8 (13.33%) patients were found in January, 12(20%) in February, 9 (15%) in March, 13 (21.67%) in April and 18 (30.0%) patients were found in May.

Table I Presenting symptoms (n=60) and physical sign in uncomplicated falciparum malaria (n=11)

Symptoms	Number of patients	Percentage (%)
Fever	60	100.0
Vomiting	49	81.67
Cough	16	26.67
Weakness	12	20
Diarrhoea	8	13.33
Altered consciousness	9	15.0
Respiratory distress	6	10.0
Dark urine	2	33.3
Oliguria	1	1.67
Physical signs	Number of patients	Percentage (%)
Rise of temperature	11	100.0
Dehydration	7	63.63
Anaemia (Pallor)	6	54.56
Hepatomegaly alone	4	36.37
Splenomegaly alone	3	27.28
Hepatosplenomegaly	2	18.18
Jaundice	2	18.18

Table I shows that the major clinical symptoms were fever in 60 (100.0%) cases, vomiting in 49 (81.67%), cough in 16 (26.67%), weakness in 12 (20%), diarrhoea in 8 (13.33%), altered consciousness in 9 (15.0%), respiratory distress in 6 (10.0%), dark urine 2 (3.33%) and Oliguria in 1 (1.67%) cases. Again among 11 uncomplicated falciparum malaria patients, all (100.0%) had rise of temperature, dehydration in 7 (63.63%) cases, pallor in 6 (54.56%) cases, only hepatomegaly in 4 (36.37%) cases, only splenomegaly in 3 (27.28%) cases, hepatosplenomegaly in 2 (18.18%) cases, and jaundice in 2 (18.18%) cases.

Table II Distribution of complications of falciparum malaria (n=49)

Complications	Number of patients	Percentage (%)
Diarrhoea	21	42.86
Cerebral malaria	15	30.62
Pulmonary oedema	7	14.28
Black water fever without renal failure	4	8.16
Black water fever without renal failure	2	4.08

Table II shows that among the studied cases 49 cases developed complications out of which 21 (42.86%) cases had diarrhoea, 15 (30.62%) cases Cerebral malaria, 7 (14.28%) cases pulmonary oedema, 4 (8.16%) cases black water fever without renal failure and 2 (4.08%) cases black water fever without renal failure.

Table III Clinical features of cerebral malaria (n=15)

Clinical features	Number of patients	Percentage (%)
Blantyre coma scale		
Score 3 or more	8	53.33
Score 3	4	26.67
Brisk tendon reflex	8	53.33
Positive Babiniski's sign	8	53.33
Convulsion	6	40.0
Pulmonary oedema	4	26.67
Abolished tendon reflex	4	26.67
Constricted pupils	4	26.67
Nuchal stiffness	2	13.33
Kernig's sign	2	13.33

Table III shows that among 15 patients of cerebral malaria, 8 (53.33%) cases had Blantyre coma score ≥ 3 , 4 (26.67%) cases had score less than 3, positive Babiniski's sign in 8 (53.33%) cases, Brisk tendon reflex in 8 (53.33%) cases, convulsion in 6 (40.0%) cases, Pulmonary oedema in 4 (26.67) cases, abolished tendon reflex in 4 (26.67) cases, constricted pupils in 4 (26.67) cases, nuchal stiffness in 2 (13.33) cases and Kernig's sign in 2 (13.33) cases.

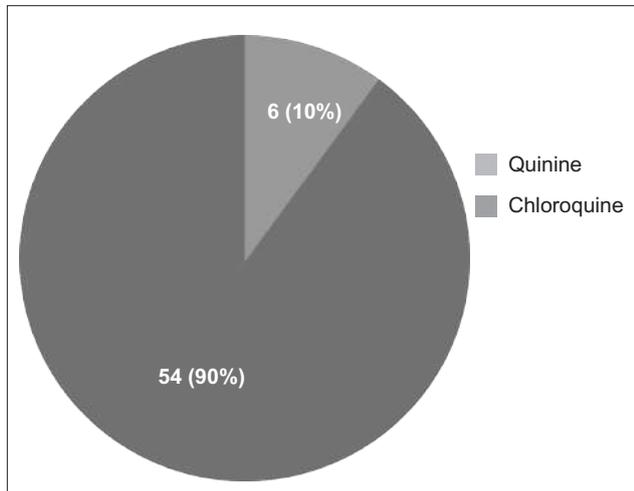


Figure 1 Specific treatment (n = 60)

Figure 1 shows that initial treatment of falciparum malaria among studied cases with chloroquine in 6 (10%) cases and with quinine in 54 (90%)

Table IV Relationship of parasitemia with the distribution of Chloquinine therapy (n = 6)

Day after treatment started	Infinity	MP count/cumm of blood			Nil
		10001 – 50000	500 – 10000	<500	
1 st	2	2	1	1	0
2 nd			4	2	0
3 rd			3	2	1
4 th			1	1	4

Figure indicates number of cases.

Table IV shows that parasitemia disappeared in 4 (66.67%) 3 days chloroquine therapy. In the remaining 2 cases parasitemia were persisting even after choloquine therapy for 3 days and they were subsequently treated with oral quinine therapy.

Table V Relationship of parasitemia with the distribution of Quinine therapy after 7 days

Day after treatment started	Infinity	MP count/cumm of blood			Nil
		10001 – 50000	500 – 10000	<500	
1 st *	4	6	16	30	0
2 nd #		4	8	35	9
3 rd			6	28	22
4 th			6	20	30
5 th			4	14	38
6 th				9	47
7 th				0	56

Figure indicates number of cases.

* One patient died.

One patient died.

Table V shows that parasitemia began to disappear in 2nd day after starting treatment with quinine and completely disappeared in all cases 7 day after starting treatment with quinine.

Table VI Outcome of patients with falciparum malaria after treatment

Outcome	Number patients	Percentage (%)
Survived	58	96.67
Expired	2	3.33
Cerebral malaria	1	1.67
Blackwater fever with renal failure	1	1.67
Residual changes in the survivors		0.000

Table VI shows that 58 (96.67%) patients survived and 2 (3.33%) patients expired. 1 (1.67%) case died of cerebral malaria and 1 (1.67%) case died of Blackwater fever with renal failure. Among the survivors none was found to have residual changes.

Discussion

Malaria is one of the six disease against which WHO has global eradication campaign. Particularly the emergency and spread of antimalarial drug resistance and the resulting increase in treatment failure and case fatality rate have turned into a serious problem.¹¹

Young age groups are non immune and hence they are more sufferer than older patients who are semi-immune due to repeated malaria infection. Studies of Chakraborty and Hussain showed that young adult group are more sufferer than late adult.¹² In this study we also found that 36.66 percent were within age of 1-4 years. 16.67 percent were within age 5-8 years and 35 percent were within age of 9-12 years which was similar to former studies.

Nothing is known about sex predilection regarding frequency of attack, severity, atypically of signs and symptoms and outcome of falciparum malaria. In Hussain and Chakraborty's studies most of the patients were male because they conducted their studies on soldiers in Combined Medical Hospital, most of which were male patients.¹² In our study, we found 50.17 percent male and 49.83 percent female patients. This is possibly due to attendance of less number of female patients in hospital because in our community the female child are usually neglected by their parents. We found no sex predilection regarding clinicohaematological profile and outcome of falciparum malaria in hospitalized children. Sometimes sex may help us to some extend to differentiate between blackwater fever and glucose-6-phosphate dehydrogenase deficiency when haemoglobinuria were present.¹²

Protein Energy Malnutrition (PEM) is a major problem in our country. Ninety four percent children suffer form different grade of malnutrition in Bangladesh. In this study 73.33 percent patients were malnourished, which is consistent with national nutritional survey study 1981-82.¹³

In one study on paediatric admissions to royal victory hospital in Banjul, Brewster showed that seasonal variation is a cardinal feature of paediatric disease and peaked following rainy seasons. The mortality was higher in rainy season than in dry season.¹⁴ Rahman showed that cerebral malaria is more common in May and June. In this study, we found that most of the cases were collected in the latter months of the study period i.e it was 13.33 percent in January and 30 percent in May.¹⁵ So this series is consistent with previous studies regarding month wise distribution of falciparum malaria cases.

Waiz mentioned that falciparum malaria has a firm root in Chittagong Hill Tracts.¹⁶ In this study, most of the cases come from Raojan (36.67%), Fatikchari (26.67%) and Rangunia (15%) which are nearer to Chittagong Hill Tracts. Only 10% patients came from Chittagong Hill Tracts. This is not consistent with study of Wiaz. This might be due to that most of the patients with falciparum malaria were well treated in local hospitals in Chittagong Hill Tracts districts where there are abundant supply of anti-malarial drug.

Malaria presents a less typical picture in child than the adult. Studies with falciparum malaria in adult were conducted by Faiz et al and Hussain.^{17,18} Faiz et al found that no patient had apyrexia in their study.¹⁷ But Hussain found apyrexia in 9 percentage of cases and he mentioned that this was due to chemoprophylaxis received by the patients.¹⁸ In present study, we found that pyrexia is present in 100 percent patients.

Faiz et al reported no case with weakness, but Hussain mentioned weakness in 72 percent cases.^{17,18} In this study it was found that 20 percent cases had weakness which is dissimilar with Faiz et al but similar with Hussain. Here complaints of weakness is less frequent in comparison with Hussain's study.¹⁸ Possibly most of children could not tell about their weakness.

Vomiting was present in 33.8 and 38 percent cases studies conducted by Faiz et al and Hussain respectively.^{17,18} Vomiting was seen in 81.67 percent cases in the present study. This reflects that vomiting is more marked in falciparum malaria in children than adults. Faiz et al mentioned no patient with oliguria or anuria, but Hussain mentioned 1 percent case who developed oliguria.^{17,18} In the present study 1.67 percent cases developed oliguria which is consistent with Hussain's study.

Frequency of altered consciousness was in 13.6 and 6.0 percent as observed by Faiz et al and Hussain respectively.^{17,18} In the present study, 15 percent cases showed altered consciousness. Neither Faiz et al. nor Hussain mentioned respiratory distress among studied adult patients, but we found that 10 percent cases developed respiratory distress.

The classical (Cold, hot and sweating stages) "Period fever" attributed to malaria is seldom seen. Clinical stages were in 2.87% in Hussain's study.¹⁸ In present study we found clinical stages in 25 percent cases, which was less in frequency in comparison with former study conducted in adult patients. This indicate that fever in falciparum malaria is more atypical in children than adults.

Hepatomegaly develops early but splenomegaly is often absent in early stages of a primary falciparum infection. In Hussain's study, splenomegaly (In 27.38% cases) were more common than hepatomegaly (In 19.17% cases).¹⁸ But in our study, hepatomegaly is more common than splenomegaly (In 45.45% cases). In comparison with former study on adults, our study reflects that hepatomegaly is more common than splenomegaly in children with falciparum malaria which is possibly due its early enlargement and most of the cases were malnourished.

Complication in malaria are most due to falciparum malaria. Complications were noted as 27.0 and 23.9 percent in the studies conducted by Hussain's and Faiz et al respectively.^{17,18} Present study showed complications in 81.67 percent cases which reflects that complications of falciparum malaria are more frequent in children than adult.

Cerebral malaria is the commonest and dreadful complication of falciparum malaria. Cerebral malaria developed in 10.6 and 10.0 percent cases in Faiz et al. and Hussain's studies in adult patient respectively.^{17,18} In the present study, cerebral malaria was present in 25 percent cases. So, it suggested that cerebral malaria is also a common complication of falciparum malaria in children.

Patient with malaria developed normocytic normochromic, sometimes hypochromic normocytic and very rarely macrocytic anaemia. During a paroxysmal attack of fever there maybe leucocytosis later on there is leucopenia with monocytosis and sometimes lymphocytosis. In Hussain's study, he showed that 3 percent cases were severely anaemic, 7 percent moderate and 21 percent mildly anaemic. He also mentioned that 15 percent patient had leucopenia, 78 percent patient had normal leucocyte count, 7 percent patient had leucocytosis, 43 percent had monocytosis and 27 percent patient had lymphocytosis. But in the present study, we found severe anaemia in 10 percent cases, moderate anaemia 50 percent cases and mild anaemia in 35 percent cases. Here leucocytosis was in 15 percent cases, leucopenia in 3.33 percent cases and normal leucocyte count in 81.67 percent cases. This series also showed monocytosis in 40 percent cases and lymphocytosis in 26.67 percent cases. So, with some variability most of the patients developed anaemia and some patients had leucopenia with lymphocytosis and monocytosis, which are consistent with former study.

Haemolysis is the common cause of anaemia in patients with falciparum malaria. In Hussain's study, 15 percent patients had evidence of haemolysis where only 4 percent had clinical jaundice.¹⁸ In the present series 16.67 percent patient had evidence of haemolysis and only 3.35 percent patients had clinical jaundice which are consistent with former study.

Fiaz et al showed that CSF was hazy in 11 percent cases.¹⁷ In the present series, we found CSF clear in all cases of cerebral malaria. No significant change in laboratory findings of CSF was observed.

P. falciparum developed chloroquine resistance in African rural areas. In Thailand and Vietnam resistance to quinine is increasing. In this study 10 percent cases other than cerebral malaria initially were treated with chloroquine. On the 4th day after treatment with chloroquine, 66.67 percent patients show clearance of parasite from peripheral blood. The remaining 33.33 percent plus patients were cerebral malaria total 90 percent patients were treated with quinine therapy. All patients were cleared of parasite from their peripheral blood on 7th day after starting quinine therapy. So, in our study, we found 33.33 percent patients with *falciparum* malaria not responded to chloroquine. But all patients of *falciparum* malaria responded to quinine therapy alone for 7 days.

Faiz et al mentioned that mortality in malaria mostly due to cerebral malaria and renal failure.¹⁷ In the present series, with the discussed chemotherapy and supportive facilities available in the hospital 96.67 percent survived without any residual changes and 3.33 percent died. 1.67 percent death were due to cerebral malaria which were attended to the hospital 2-3 days after unconsciousness and 1.67 percent died of blackwater fever with renal failure. In this study all deaths were due to cerebral malaria and renal failure which is consistent with study on adult patients.

Conclusion

Falciparum malaria in children is quite common in our country particularly in Chittagong Hill Tracts. This small prospective study with only 60 cases involving only a specific region may not represent the true picture of our country. So, extensive research with bigger sample size may be needed in future.

Moreover, it is seen that many children are coming with unusual presentation like vomiting, headache, altered consciousness, convulsion, jaundice, diarrhea etc along with fever. These cases remain undiagnosed in the first instance. However, when the classical treatment fails, then we may look for malaria parasites in the blood. So there is necessity to see the clinical presentation, response to anti malarial therapy and its prognosis in children.

This study will help to identify the atypical signs and symptoms like fever with headache, bodyache, joint pain, dizziness, altered sensorium, hepatosplenomegaly etc of *falciparum* malaria especially in the children of endemic zone and effective quinine therapy ultimately reducing unwanted morbidity and mortality from severity of *falciparum* malaria.

This study may conclude that the symptomatology of *falciparum* malaria in children differs from that of adults having very good response to early quinine therapy. So, early suspicions of *falciparum* malaria in children with quinine therapy can reduce unwanted malaria mortality.

Disclosure

All the authors declared no competing interests.

References

1. World Health Organization. World Malaria Report. Geneva: World Health Organization. 2005.
2. Noedl H, Fiaz MA, Yunus EB, Rahman MR, Hossain MA, Smad R et al. drug-resistant malaria in Bangladesh: In vitro assessment. *Am J Trop Med Hyg.* 2003;68:140-142.
3. Rosenberg R, Maheswary NP. Chloroquine resistant *Plasmodium falciparum* in Bangladesh. *Trans R Soc Trop Med Hyg.* 1977;70:533.
4. Cotran RS, Kumar V, Collins T. Robbins Pathology Basis Of Disease. 6th Edn. 583 Orchard Road Singapore: Harcourt Asia PTE Ltd. 1999;389-390.
5. Terrie TE Malaria. *Med Intern. Bangladesh Edition.* 1992;5:4502-4508.
6. The work of WHO 1990-91, Report of The Director General Of Health Services, Bangladesh. 1992;87-88.
7. Kliegman RM, Behrman RE, Jenson HB, Stanton BF, Nelson Textbook of Paediatric. 18th Edn, Philadelphia: Saunders. 2008:1477-1479.
8. Hey WW, Hayward AR, Levin MJ, Sondheimer JM. Current paediatrics diagnosis and treatment. 16th edn. USA: Mc Graw-Hill. 1999;1213-1215.
9. Tipton CM. Susruta of India, an unrecognized contributor to the history of exercise physiology. *J appl physiol.* 2008;104 (6): 1553 – 1556.
10. Dobson MJ. Malaria in England: a geographical and historical perspective. *Parassitologia.* 1994;36: 35-60.
11. O'Dempsey JJ, McArdle TF, Laurence BE, Lamont AC, Todd JE, Greenwood BM Overlap in the clinical feature of pneumonia and malaria in African children. 1996.
12. Chakraborty B. an analysis of 40 cases of cerebral malaria [Dissertation] Dhaka. Bangladesh Collage of Physician and Surgeons. 1989.
13. Pang LW et al. Doxycycline prophylaxis for *falciparum* malaria. *Lancet.* 1987;1162-1167.
14. Brewster DR. Seasonal variation of paediatric disease in Gazbia, West Africa. *Ann Trop Paediatr.* 1993;13:33-46.
15. Rahman M. cerebral malaria study of 64 cases Bangladesh Armed Forces Med J. 1991.
16. Wiaz A. Malaria-Magnitude Problem in Bangladesh [Editorial] Bangladesh Armed Forces Med J. 1984; 73:47-50.
17. Fiaz A. Awal ARMA, Chowdhury SGM. Complication of *falciparum* malaria. *J Bangladesh Col. Phy Surg.* 1985;3:22-26.
18. Hussain B. Presentation of *falciparum* malaria [Dissertation] Dhaka. Bangladesh Collage of Physician and Surgeons. 1992.

Giant Cell Tumour of Dorsal Vertebra: A Case Report

Nasima Akhter^{1*} Moklesur Rahman² Abu Khaled Muhammod Iqbal³ Shameem Waheed⁴ Md Russell⁵

ABSTRACT

Background : Giant Cell Tumour (GCT) of the axial spine is a rare entity. The majority of cases affect sacrum. Lesions above sacrum account for only 1-1.5% cases. Timely diagnosis & definitive treatment is required for prevention of complication. The purpose of this case report is to make known the clinical characteristics, the presentation and the treatment used to solve this pathology.

Case Presentation : Here we present a case of 57 years male who presented with a painful swelling over back in lower thoracic region for 06 months. FNAC was consistent with giant cell tumour of bone. MRI of dorsal spine showed expansile destructive lesion in posterior element of D11 vertebra with extension into spinal canal causing indentation of thecal sac, narrowing of spinal canal & compression of spinal cord at this level. Surgical excision of D11 spinous process was done. Post-op histopathological examination of the tumor confirmed diagnosis as GCT of bone. Patient improved clinically after surgery. Postoperative F/U MRI revealed maintenance of dorso-lumber curvature with normal vertebral alignment & resected spinous process of D11 vertebra. No evidence of focal collection or abnormal signal noted in adjacent soft tissue of D11 level.

Conclusion: GCTs are rare in the dorsal vertebrae. In some cases, when there is cortical involvement, metastasis can develop and complicate the patient's prognosis, therefore, a timely diagnosis is required to improve it.

Introduction

Giant Cell Tumour (GCT) of bone is a benign osteolytic tumour with three main cellular components: multinucleated osteoclast-like giant cells, mononuclear spindle-like stromal cells (The main neoplastic components) and mononuclear cells of the monocyte/ macrophage lineage. It is locally aggressive benign tumour with unpredictable outcome.^{1,2} It accounts for approximately 5% of all primary bone tumors in adults. However it is uncommon in axial skeleton, mostly occurring in sacrum. They are distinctly rare above the sacrum. Involvement of mobile spinal segment is seen in 1-1.5% cases with roughly equal incidence seen in all three mobile spinal segments. They affect vertebral body primarily causing expansile lytic destruction and may extend to neural arch and paraspinal soft tissue.^{3,4} Various modalities of treatment are available for spinal GCTs such as surgery, radiotherapy, embolization, cryosurgery, cementation and chemical adjuvant like phenol

or liquid nitrogen but optimal treatment has not been well established and the recurrence rate is high despite the best management. Whenever possible, en bloc excision should be pursued as the surgical procedure of choice for spinal GCT as it has the least recurrence rate. They carry much worse prognosis than the lesions in long bones.⁵

Case Report

A 57-year-old male patient presented at Combined Military Hospital (CMH) Chattogram (Study period was February to October 2021) with low back pain and swelling over the lower thoracic region for 06 months. General examination was unremarkable. On local examination of back, the swelling measured approximately (4x3) cm in size, local temperature was not raised, tender on deep palpation, firm in consistency, immobile, margin was illdefined, no superficial engorged vein, non compressible, slipping sign absent, free from overlying skin but fixed to underlying structure, muscle power was normal. Bowel & bladder habits were normal. His vital signs were normal.

MRI (Figure 1 & 2) showed destructive expansile lesion with signal intensity changed in posterior element of D11 vertebra involving pedicle, lamina on both sides & spinous process, appear isointense on T1W, hyperintense on T2W & STIR images. Post contrast scans revealed enhancement of the lesion. Extension of the lesion into the spinal canal at this level observed on both lateral & posterior aspect causing indentation of thecal sac, narrowing of spinal canal & compression of spinal cord at this level. Mild narrowing of intervertebral foramina at D11/D12 level observed. No signal abnormality was noted in dorsal spinal cord. No signal abnormality was noted in retrovertebral region involving subcutaneous tissue & superficial muscles at the level D10 to D12.

1. Lt Col & Classified Specialist in Surgery
Combined Military Hospital (CMH) Chattogram.
2. Brigadier General & Adviser Specialist in Orthopedics
Combined Military Hospital (CMH) Chattogram.
3. Assistant Professor of Surgical Oncology
Chittagong Medical College, Chattogram.
4. Brigadier General & Classified Specialist in Urology
Combined Military Hospital (CMH) Dhaka.
5. Associate Professor of Surgical Oncology
Bangabandhu Sheikh Mujib Medical University (BSMMU) Dhaka.

*Correspondence: **Lt Col (Dr) Nasima Akhter**
Cell: +88 01922 25 75 79
Email: dr.nasima77@gmail.com

Submitted on : 17th October 2021
Accepted on : 3rd December 2021

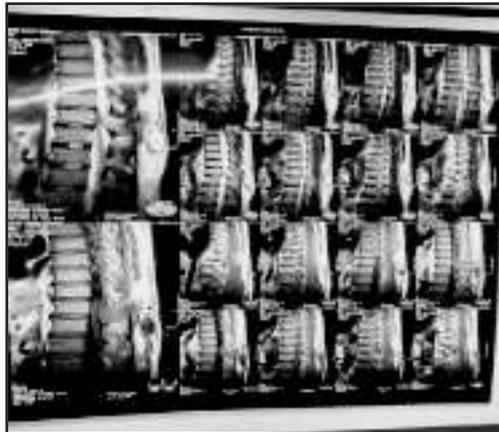


Figure 1 MRI of dorsal spine showed expansile destructive lesion in posterior element of D11 vertebra with extension into spinal canal causing indentation of thecal sac, narrowing of spinal canal & compression of spinal cord at this level



Figure 2 MRI of dorsal spine showed expansile destructive lesion in posterior element of D11 vertebra

CT scan of dorsal vertebra (Figure 3) shows expansile destructive lesion in posterior element of D11 vertebra with extension into spinal canal and posterior para vertebral soft tissue and attenuation of the neural foramina of D11/D12 noted.

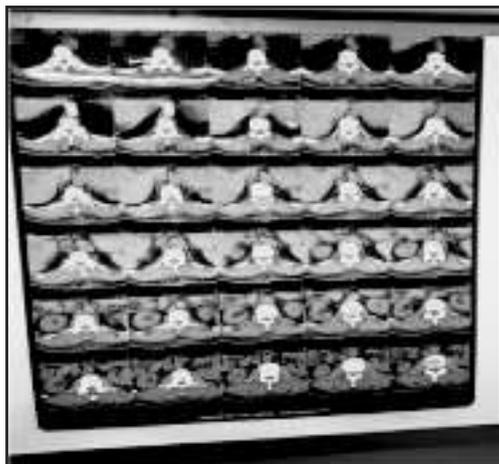


Figure 3 Expansile destructive lesion in posterior element of D11 vertebra

Preoperative biopsy report (Figure 4, Figure 5) showed tumour composed of diffuse expansive sheets of oval to spindle cells & a fair number of osteoclast-like multinucleated giant cells consistent with giant cell tumour of bone.



Figure 4 Histopathology report of GCT

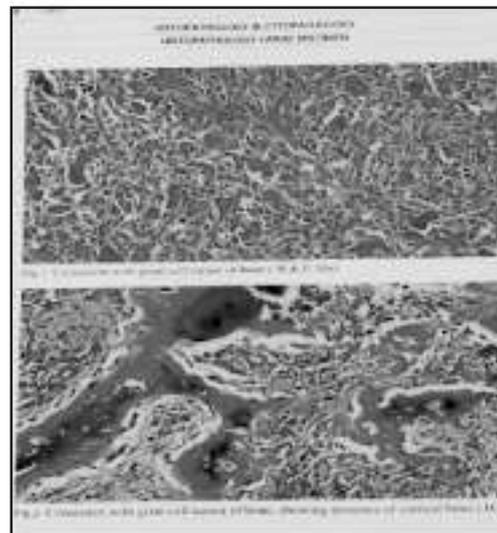


Figure 5 Histopathology report of GCT

He underwent surgical excision of D11 spinous process . Peroperative findings were- tumour of grey brown colour, moderately vascular, involving whole spinous process. Left sided lamina, pedicle, body seemed to be intact.

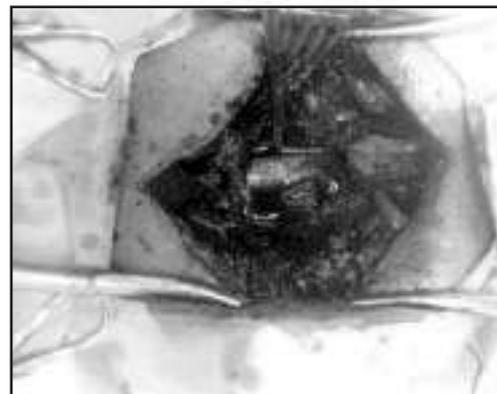


Figure 6 Peroperative finding

Spinal cord was compressed from posterior aspect. Post-op histopathological examination of the tumor confirmed diagnosis as GCT of bone. It was made of many multinucleated giant cells. Supporting stromal cell showed mild pleomorphisms with occasional mitosis.

Patient improved clinically after surgery. He was planned for regular post operative follow up. F/U MRI revealed maintenance of dorso-lumber curvature with normal vertebral alignment. Spinous process resection seen at D11 vertebra. No evidence of focal collection or abnormal signal noted in adjacent soft tissue of D11 vertebra.

Discussion

GCT of thoracic vertebrae is quite infrequent. Sacrum is commonly affected in axial spine. They were previously termed as osteoclastoma because they were considered to arise from the osteoclasts. However, the exact cell of origin is unclear.¹⁻⁶ The histologic appearance of GCT is a uniform distribution of multinucleated giant cells against a background of round to spindle shaped atypical mononuclear stromal cells. Haphazardly arranged multinucleated giant cells but benign looking oval to plump stromal cells are also seen in few benign bone lesions like Osteochondromas, osteoblastoma, chondroblastoma, chondromyxoid fibroma, brown tumor of hyperparathyroidism, eosinophilic granuloma, fibrous dysplasia and aneurysmal bone cysts.^{7,8} Spinal GCT on radiographic image is seen as round or oval mass with shell-like calcification devoid of mineralized matrix.³

Spinal GCTs most commonly present with pain due to expansile lesion with or without vertebral collapse and spinal instability.⁷ This often gets compounded by neurological deficit due to encroachment onto the spinal canal.⁸ Asymptomatic, incidental radiological occurrence is uncommon in spinal GCTs. GCT being highly vascular tumor, DSA aided tumor embolization within 24 hours before surgery is recommended.⁹ This not only minimizes blood loss, but also permits the surgeon a dry field to carry out optimum tumor excision. In some cases however, DSA shows that a common vascular feeder supplies the spinal cord as well as the tumor. In such cases, embolization cannot be carried out due to risk of vascular infarct to the spinal cord.⁶

As opposed to other tumors, vertebral body and soft-tissue involvement may be present. Histological confirmation of the diagnosis requires a surgical biopsy or a CT scan guided puncture biopsy, whose reliability is 65%.^{3,7,8,9} In most cases, the histological examination confirms the diagnosis of GCT and excludes the main differential diagnoses, in particular aneurysmal cyst.^{7,8} The different recommended treatment protocols for spinal GCTs are surgery, radiotherapy, cryosurgery, cementation, and chemical adjuvant therapy. Total en bloc surgical debridement is the treatment of choice in long bones as well as spine but is not always feasible in the spine due to the unacceptable risk of permanent neurological deficit.⁸

Simple curettage can lead to local recurrence in 24-40% cases, which can be minimized by adjuvant treatment of cement implantation and chemical therapy.² Due to the risk of myelitis and bone graft complications, adjuvant radiotherapy should be reserved for incomplete tumor excision and local recurrence.^{10,11}

Conclusion

Though giant cell tumor of the spine is uncommon, it should be kept in the differential diagnosis of expansile lytic bone lesion affecting vertebral body. Severe morbidity can occur due to its locally destructive effects. Though MRI findings are somewhat characteristic, definitive diagnosis based solely on MR characteristics may not be always possible and histopathology remains the gold standard. Among various treatment modalities available, en bloc surgical resection is the treatment of choice.

Disclosure

All the authors declared no competing interests.

References

- Mendenhall WM, Zlotecki RA, Scarborough MT, Gibbs CP, Mendenhall NP. Giant cell tumor of bone. *Am J Clin Oncol*. 2006; 29:96-99.
- Redhu R, Poonia R. Giant cell tumor of dorsal vertebral body. *Journal of Craniovertebral Junction and Spine*. 2012; 3(2):67-69.
- A Soltani, S Adel, M Mashari, M Panahbekhoda, S Fallahpour. Giant-Cell Tumor of Third Lumbar Vertebrae: A Case Report. *The Internet Journal of Spine Surgery*. 2009; (5)2.
- Sakurai H, Mitsuhashi N, Hayakawa K, Niibe H. Giant cell tumor of the thoracic spine simulating mediastinal neoplasm. *AJNR Am J Neuroradiol*. 1999; 20(9):1723-1726.
- Martin C, McCarthy EF. Giant cell tumor of the sacrum and spine: series of 23 cases and a review of the literature. *The Iowa Orthopaedic Journal*. 2010; 30:69-75.
- Guzman R, Dubach-schwizer S, Heini P, Lovblad KO, Kalbermatten D, Schroth G, et al. Preoperative embolization of vertebral metastases. *Eur Spine J*. 2005;14:263-268.
- Sobti S, John PS, Kumar A et al. Giant cell tumor of dorsal spine. *J Spine Surg*. 2016;3(3):112-113.
- Boriani S, Weinstein JN, Biagini R. Primary bone tumors of the spine. Terminology and surgical staging. *Spine*. 1997;22(9):1036-1044.
- Campanacci M, Baldini N, Boriani S et al. Giant-cell tumor of bone. *J Bone Joint Surg Am*. 1987;69(1):106-114.
- Schutte HE, Taconis WK. Giant cell tumor in children and adolescents. *Skeletal Radiol*. 1993;22(3):173-176.
- Fidler MW. Surgical treatment of giant cell tumours of the thoracic and lumbar spine: Report of nine patients. *Eur Spine J*. 2001;10(1):69-77.

Infected Gap Nonunion of Humerus by Induced Membrane Formation in Masquelet's Technique : A Case Report

Tafhim Ehsan Kabir^{1*} Alak Kanti Biswas² Chinmoy Baidya³ Azwad Azdar⁴ Md Ridwanul Hoque⁴
Arpon Dey⁴ Qutub Uddin⁴ Biswajit Kumar Das⁴ Tusher Kanti Nath⁴

ABSTRACT

Background : Infected gap nonunion of Humerus is common but not easy to manage. Although some techniques existing from before having some limitations, induced membrane formation in Masquelet's Technique is being practiced by surgeon nowadays. In this technique, bridging is done by bone cement as a spacer in first stage followed by autologous cancellous bone graft with a bridging plate in case of more than 5 cm gap nonunion. The aim of this study was to restore infected gap nonunion in long bone by induced membrane formation.

Case Presentation : A 50-year-old, male patient presented on January 2021 to us with close fracture of midshaft of left humerus. He had history of ORIF done on that fracture 22 years back. It was fixed by Dynamic Compression Plate (DCP). Again the patient had a fall injury 2 years back and he was injured at the same site. After receiving different treatment strategies the patient presented to us with implant failure.

Conclusion : Induced Membrane Formation in Masquelet's Technique is the best possible way in management of infected gap nonunion in recent days. This two stage method overcomes the limitation of other procedure where healing ensues in patients own microbiome.

Key words: Fracture; Induced membrane formation; Infected gap nonunion of humerus.

Introduction

Humeral fractures are common in the general population. They comprise approximately 7–8 % of all adult fractures in the western world and their incidence has been reported to increase with age.¹ Among humeral shaft fractures, those which are located in the lower/upper third of the shaft represent more than 80% of the total cases, where 60% of the fractures occur in people over the age of 50. In over 60% of the cases, the affected bone part was the middle third, with transverse and short spiral fractures.^{2,3} Due to its complex neurovascular anatomy formed by a complex network of muscles, nerves and arteries, it is very important to perform a thorough examination of a fracture before undertaking surgical or non-surgical decisions. However, despite the success of non-operative treatments of humeral shaft fractures, there are several types of fractures which require an open reduction and internal

fixation.^{4,5} Any trauma or injury with comorbidity like uncontrolled diabetes, excessive pressure, physiological imbalance etc. can cause infected gap nonunion, followed by implant failure in some instances. These defects are not easy to operate.

It is generally accepted that bone defects shorter than 6 cm can be treated by non-vascularized autologous bone grafting while the defects longer than 6 cm are managed by other techniques such as distraction osteogenesis, free vascularized fibular bone graft, allograft, titanium cages, or even amputation in extreme cases.⁶⁻¹¹ Recently, Masquelet introduced a two-stage procedure called the Induced Membrane Technique (IMT) to treat segmental bone defects.¹² During the first stage, after debridement and stabilization of the bone using an external fixator, a Polymethyl Methacrylate (PMMA) cement spacer is placed in the defect area to maintain limb length, prevent interposed soft tissue between the fracture ends, and induce a biologic membrane. The second stage of the procedure is performed usually 6 to 10 weeks after the first stage and involves careful incision of the induced membrane to remove the spacer. The spacer is later replaced by a large volume of cancellous bone graft harvested from the iliac crest. It is believed that the self-induced membrane serves as a reservoir for bone grafts, which provide osteoinductive growth factors for bone healing.¹³ This concept is known as "induced membrane formation" at the gap nonunion.

The purpose of the study was to restore infected gap nonunion in long bone by induced membrane formation.

1. Associate Professor of Orthopaedic Surgery
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
2. Professor of Orthopaedic Surgery
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
3. Associate Professor (cc) of Community Medicine
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
4. Medical Officer of Orthopaedic Surgery
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.

*Correspondence: **Dr. Tafhim Ehsan Kabir**
Cell: +88 01712 27 64 87
Email: tafhimekf@yahoo.com

Submitted on : 2nd5th December 2021
Accepted on : 27th December 2021

Case Report

A 50-year-old, right hand dominant, male patient presented us with close fracture of midshaft of left humerus between January 2021 and November 2021. He had history of ORIF done on close fracture of midshaft of left humerus, 22 years back. He sustained the fracture in an RTA and was operated 15 days after the trauma in a Government hospital in Pakistan. It was fixed by Dynamic Compression Plate (DCP). Approximately after 1 month of post-operative period, patient developed multiple discharging sinuses on the left arm through which thick purulent discharge was seen. He was advised for regular dressing. As the infection was not controlled, metallic hardware was removed and external fixator was applied for 4 months with regular dressing. Gradually infection was controlled and all the wounds were healed.

After one and half years of 2nd procedure external fixator was removed and again ORIF with Dynamic Compression Plate (DCP) with autogenous cancellous bone grafting was done. After 3 weeks of post-operative period multiple discharging sinuses developed again but he neglected the condition and drained the wound by himself. Then, 5 months later gradually multiple dead pieces of bone was coming out through the wound and he came back to Bangladesh after 3 years of suffering. He took several antibiotics prescribed by quack or pseudo healers and drained the wound in several centers.

Again the patient had a fall injury 2 years back and he was injured at the same site but he did not take any treatment. 3 months prior his visit to us, he was admitted in Chittagong Medical College with the complaints of swelling and discharge of pus in the injured area with uncontrolled Diabetes mellitus. The patient was kept on oral antibiotics for one and a half month for infection control and diabetes was controlled by endocrinologist / Endocrinology Department of Chittagong Medical College. After completion of antibiotic coverage, the patient presented to us with implant failure. So, first stage of masquelet procedure was done. At this stage, a spacer made up of antibiotic-impregnated bone cement was shaped and sized according to the humerus and was integrated at the gap nonunion with bone stabilization done by breeze plating using 12 hole Locking Compression Plate (LCP). A drain was kept in situ. Patient was kept under intravenous antibiotics in post-operative period for 2 weeks followed by 6 weeks oral antibiotics.

Patient was monitored closely in this time, no discharge or any signs of inflammation were seen and the wound had healed and healthy. Afterwards the second stage was planned for next week. Through the same incision spacer site was exposed and the spacer with its surrounding membrane was approached. Bone cement showed up and membrane lined cavity was seen after a sharp incision made through the membrane formed around the bone and the spacer. There was no accumulation of pus or dead or necrotic tissue found at the wound site.

To fill inside the membrane lined cavity, autogenous cancellous bone graft was taken from the iliac crest. Membrane was sutured over which a 12-holes locking compression plate in a bridging and locking mode was already placed. The wound was closed accordingly. After that a U cast was given for immobilisation and Intra venous antibiotics were administered for two weeks. After two weeks the wound was inspected healthy and sutures were removed. Post-operative immobilisation was carried on for next 4 weeks and then active mobilisation of the limb was commenced.

Patient was discharged with advice and asked to re-evaluate at the end of 4 months. The graft had integrated into the bone and all the gap had been restored at the nonunion site radiographically. Flexion and extension at the elbow was completely restored functionally. Consecutive radiographs of the procedure till date from the beginning of first surgery. (Figure 1-6).



Figure 1 Initial radiograph, 22 years after primary fixation showing implant failure



Figure 2 Radiograph showing bone cement as a spacer in mid-shaft of humerus



Figure 3 Radiograph showing after bone grafting and plating



Figure 4 Radiograph after 3 months of plating and bone grafting



Figure 5 Radiograph showing 4 months after bone grafting



Figure 6 Radiograph showing 8 months after bone grafting

Discussion

It was challenging to manage posttraumatic segmental bone defects as the techniques available were difficult to perform. Also, the long-term outcomes were limited by high rates of complications and reoperations, as well as poor functional outcomes.

Smaller defects could be treated with autologous bone graft and rigid fixation, but not when the defect size exceed 5 cm. Because, beyond 4-5 cm defect, the bone graft got resorbed and the defect remains. Even though cancellous bone grafts had higher osteo-conductive and osteo-inductive capacities.^{14, 15, 16} Larger defects could be treated by vascularised bone transfer or distraction histiogenesis. The transfer of vascularised bone was limited by pedicle length and training of microsurgical anastomose technique.¹⁷

Distraction histiogenesis helped to bridge the bone gap but required training, long learning curve and had complications. The technique of "induced membrane formation and bone grafting" was first described by Masquelet of France in 1986.¹⁴

This method was used to bridge the diaphyseal defects of up to 25 cm in length. In this technique methyl methacrylate cement spacer induces formation of a membrane thus creating a pocket for subsequent bone grafting. In other words the closed space created by removal of cement spacer acted as a biological chamber. Pelissier et al determined that these membranes had a rich capillary network and secretes growth factors (VEGF and TGF-beta 1) and osteoinductive factor (BMP-2) in high concentrations as early as 2 weeks.^{18, 19, 20} The inner part of the membrane which was facing the cement was a synovium like epithelium and outer part was made of fibroblast, myofibroblast and collagen. Last but not the least, according to Masquelet, membrane extracts were shown to stimulate bone marrow cell proliferation and differentiation to osteoblastic lineage.¹⁴

The membrane prevents resorption of the cancellous bone graft while it was known that a large amount of cancellous bone placed in a vascular environment was partially or completely resorbed. The membrane promoted vascularisation and corticalisation of the cancellous bone.^{17, 18} It was considered as an in situ delivery system for osteoinductive factors.²⁰

Another important purpose which the spacer serves was that the block placed between the gap helped the soft tissue to not collapse at the fracture site and the space was maintained for subsequent bone grafting.^{19, 21}

In our case, all the steps were followed accordingly and induced membrane was observed intra-operatively. In our case, patient could do movement 1 month after immobilisation and complete flexion and extension at the elbow joint was functionally possible after 4 months.

This type of management was not common in our region, also not documented in humerus fracture. Also, there was a dire need of expertise in handling infected gap nonunion. Considering about limited resource, cost and socio demographic circumstances this technique was a solution with better outcome.

Conclusion

Induced Membrane Formation in Masquelet's Technique is the best possible way in management of infected gap nonunion in recent days. This two stage method overcomes the limitation of other procedure where healing ensues in patients person own microbiome.

Disclosure

All the authors declared no competing interest.

References

1. Court-Brown CM, Caesar B. Epidemiology of adult fractures: a review. *Injury*. 2006;37(8):691–697.
2. Pidhorz, L. Acute and chronic humeral shaft fractures in adults. *Orthop. Traumatol. Surg. Res.* 2015;101:S41–S49. [CrossRef].
3. Alexandru, L., Haragus, H., Deleanu, B., Timar, B., Poenaru, D.V.; Vlad, D.C. Haematology panel biomarkers for humeral, femoral and tibial diaphyseal fractures. *Int. Orthop.* 2019;43:1–6. [CrossRef] [PubMed].
4. Kumar, V., Rathinam, M. Fractures of the shaft of the humerus. *J. Orthop. Trauma.* 2013;27:393–402. [CrossRef].
5. Ramadani, F., Härägus, H., Radu, P., Trieb, K., Hofstaetter, S. Komplexe Rekonstruktionen mit winkelstabiler interner Plattenfixation bei Charcot-Arthropathie. *Der Orthopäde.* 2015;44:33–38. [CrossRef] [PubMed].
6. V. D. Polyzois, I. P. Stathopoulos, K. Lampropoulou-Adamidou, E. S. Vasiliadis, J. Vlamis, and S. G. Pneumaticos. Strategies for managing bone defects of the lower extremity. *Clinics in Podiatric Medicine and Surgery.* 2014;31(4):577–584.
7. Z. Gugala, R. W. Lindsey, S. Gogolewski. New approaches in the treatment of critical-size segmental defects in long bones. *Macromolecular Symposia.* 2007;253(1):147–161.
8. S. Rigal, P. Merloz, D. le Nen, H. Mathevon, and A. C. Masquelet. Bone transport techniques in posttraumatic bone defects. *Orthopaedics & Traumatology: Surgery & Research.* 2012;98(1):103–108.
9. M. Bumbasirevic, M. Stevanovic, V. Bumbasirevic, A. Lesic, H. D. Atkinson. Free vascularised fibular grafts in orthopaedics. *International Orthopaedics.* 2014;38(6):1277–1282.
10. M. J. Chmell, M. P. McAndrew, R. Thomas and H. S. Schwartz. Structural allografts for reconstruction of lower extremity open fractures with 10 centimeters or more of acute segmental defects. *Journal of Orthopaedic Trauma.* 1995;9(3):222–226.
11. J. A. Cobos, R. W. Lindsey, and Z. Gugala. The cylindrical titanium mesh cage for treatment of a long bone segmental defect: Description of a new technique and report of two cases. *Journal of Orthopaedic Trauma.* 2000;14(1):54–59.
12. P. R. Stafford and B. L. Norris. Reamer-irrigator-aspirator bone graft and bi Masquelet technique for segmental bone defect nonunions: A review of 25 cases. *Injury.* 2010;41:S72–S77, .
13. Chen-An Hsu, Shih-Heng Chen, Soa-Yu Chan, Yi-Hsun Yu. The Induced Membrane Technique for the Management of Segmental Tibial Defect or Nonunion: A Systematic Review and Meta-Analysis. *BioMed Research International.* Article ID 5893642. 2020;2020:9. <https://doi.org/10.1155/2020/5893642>.
14. Masquelet AC, Obert L. Induced membrane technique for bone defects in hand and wrist. *Chir Main.* 2010; 29 (Suppl1):S221-S224.
15. Romana MC, Masquelet AC. Vascularised periosteum associated with cancellous bone graft: An experimental study. *Plast Reconstr Surg.* 1990; 85:587-592.
16. Masquelet AC, Fitoussi F, Begue T, Muller GP. Reconstruction des os longs par membrane induite et autogreffe spongieuse. *Ann Chir Plast Esthet.* 2000; 45:346-353.
17. Woon CY, Chong KW, Wong MK. Induced membranes e a staged technique of bone grafting for segmental bone loss: A report of two cases and a literature review. *J Bone Joint Surg Am.* 2010; 92:196-201.
18. Pelissier P, Masquelet AC, Bareille R, Mathoulin-Pelissier S, Amedee J. Induced membranes secretes growth factors including vascular and osteoinductive factors and could stimulate bone regeneration. *J Orthop Res.* 2004; 22:73-79.
19. Pelissier P, Martin D, Baudet J, Lepreux S, Masquelet AC. Behaviour of cancellous bone graft placed in induced membranes. *Br J Plast Surg.* 2002; 55:596-598.
20. Spinella-Jaegle S, Roman S, Faucheu C, et al. Opposite effects of BMP-2 and TGF beta-1 on osteoblast differentiation. *Bone.* 1998; 29:323-330.
21. Chong KW, Woon CY, Wong MK. Induced membranes: A staged technique of bone grafting for segmental bone loss: Surgical technique. *J Bone Joint Surg Am.* 2011; 93 (Suppl 1):85-91.

**JAMCC is Privileged to Propose Gratitude to
The Respected Reviewers for December 2021**

- **Professor (Dr.) Moquaddes Akther Begum**
Head, Department of Obstetrics & Gynaecology (Retired)
Chittagong Medical College, Chattogram.
- **Professor (Dr.) Asok Kumar Dutta**
Head, Department of Medicine (Retired)
Chittagong Medical College, Chattogram.
- **Professor (Dr.) Mahmood A Chowdhury Arzu**
Head, Department of Paediatrics
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
- **Professor (Dr.) M Jalal Uddin**
Head, Department of Community Medicine
Chattogram Maa-O-Shishu Hospital Medical College, Chattogram.
- **Professor (Dr.) Md Motiar Rahaman Khan**
Head, Department of Surgery
Chittagong Medical College, Chattogram.
- **Professor (Dr.) Prabir Kumar Das**
Head, Department of Cardiology (Retired)
Chittagong Medical College, Chattogram.
- **Professor (Dr.) Bidhan Roy Chowdury**
Department of Paediatrics
Institute of Applied Health Sciences (IAHS) Chattogram.
- **Professor (Dr.) Ershad Uddin Ahmed**
Head, Department of Gastroenterology
Chittagong Medical College, Chattogram

(List is not according to Seniority)



Army Medical College Chattogram

Chattogram Cantonment, Chattogram, Bangladesh.

Phone : 88-031-2580425, Email : jamcc.bd@gmail.com

www : amcc.edu.bd/journal

Guidelines for Authors

Journal of Army Medical College Chattogram (JAMCC)

Army Medical College Chattogram (AMCC) has established in the year 2014. It is located in Chattogram Cantonment, Bangladesh, affiliated with Bangladesh University of Professionals.

AMCC started its academic journey on 11 January 2015 with 50 students and 13 faculty members, which is recognised by Bangladesh Medical and Dental Council (BMDC).

Army Medical College Chattogram inaugurated to publish a double blinded, peer reviewed scientific journal from June 2018, which is recognized by Bangladesh Medical and Dental Council (BMDC) and having International Standard Serial Number (ISSN)- 2663-778X. Journal of Army Medical College Chattogram (JAMCC) is published twice in a year (June and December). The theme of JAMCC is :

"Transforming Health Care Through Research".

The journal intends to publish article of authors from any part of the globe, but has a special interest in publishing original, research article, special articles, review articles, case report, meta analysis, editorial, letter to the editors. While preparing the manuscript authors are requested to follow the uniform requirements for manuscript submitted to Biomedical Journals prepared by International committee of Medical Journal Editor (ICMJE) which is available at <http://www.icmje.org>.

Conditions for Submission of Manuscript

Manuscript should be submitted to the concerned person or submitted by email. **Email** : jamcc.ctg.bd@gmail.com at any time.

Manuscripts accepted for the publications are subjected to peer-review and editorial revision. Submitted manuscripts should not be previously published or being considered for publication in a different journal. The manuscript should be prepared using MS Word (2003 or 2007). All text (title page, abstract, body, references) should be submitted as one document and should be prepared in accordance with the Vancouver style. Authors must submit two copies of the paper written in English (A4 size white blond paper, font size 12 and Style: Arial, double space, Margin 5 cm for the header and 2.5 cm for the remainder). Acceptance is based on originality, clarity, fulfillment of the criteria of the publication policy of this journal. Submission of manuscript through email with all file attachment of documents is welcome.

A cover letter should be addressed to the Editor-In-Chief of the journal. It should contain a declaration that this manuscript has not been published anywhere.

Preparation of Manuscript

Title Page

The title page should contain the title of the article as well as name of all authors with their designation, institutional affiliation, cell no and email ID. The correspondent author's name and address should be mentioned with cell no. and email ID.

Abstracts

Abstract should be structured with background, methods, results and conclusion. Abstract should not be more than 250 words. There will be a single paragraph. Avoid abbreviations, diagrams, p-values and references in the abstract.

Key words: Appropriate and short. 3 to 10 key words may be provided.

Text

The main body of the text should be divided into introduction, materials and methods, results, discussion, conclusion, disclosure and references.

Introduction should not exceed more than 500 words. Methods should be including type of study, time and place of the study, population, procedure and statistical procedure for data analysis and approval of the study by the Ethical Review Committee. Results should be presented in logical sequence in the text, tables and illustrations. The whole body of the text should not exceed 6000 words (Excluding abstract, table, figure, reference). The total number of references will not be more than 25 and less than 15 for the original article.

Tables

All tables should be in result section. It should be simple and self explanatory. It also should be using roman numerical which numbered consecutively using roman numerical (eg. Table I, II). A short descriptive title should appear above each table with a clear legend and any footnotes suitably identified below. Captions should be typed, double-spaced, on a separate sheet.

Figures/Graphs

Should be submitted in original as brief as possible. Figure should be numbered in Arabic numerical (eg. Fig 1, 2) followed by the legend on the bottom of the figure. Its noted that maximum numbers of table and figure 5/6 nos. No punctuation mark in caption of Tables and Figures.

Illustrations

All illustrations must be numbered and cited in the text. Print photograph, B2 size with good contrast (600 pixels) should be submitted. Figure number and name of the 1st author should be written on the back of each photograph marking the top edge. For case report only 3 photographs are allowed.

Abbreviations

Standard abbreviation should be used. The full form for which the abbreviation stands followed by the abbreviation in parenthesis should be preceded the use of the abbreviation in the text except the standard ones.

References

References are to be numbered consecutively and cited at the end of the sentences in the order in which they appear in the text. Cited references should not be 10-15 years back.

References from Journals

References should be written according to the following sequence: authors(s) name, subject, name of journal with years of publication, volume number, page number. If there are six authors or less, names of all the authors should be written, when there are seven authors or more the first three names will be listed and then word "et al" to be added. Name of journals may be abbreviated but that must be according to style used in Index Medicus.

Example

Standard Journal Article

Abraham W, Wertz PW, Downing DT. Linoleate-rich acylglucosylceramides of pig epidermis: Structure determination by proton magnetic resonance. *J Lipid Res.* 1985; 26:761-766.

Agarwall P, Datta S, Garg SK et al. Multiple dose pharmacokinetics of ciprofloxacin in preterm babies. *Indian pediatr.* 2004; 4:1001-1007.

Organization as Author

The TIME Investigator. Trial of invasive versus medical therapy in elderly patients with chronic symptomatic coronary artery diseases (TIME): A randomized trial. *The Lancet.* 2001; 358(9286):951-957.

No Issue and No Volume

Browell DA, Lennard TW. Immunologic status of the cancer patient and the effects of blood transfusion on antitumour responses. *Curr Opin Gen Surg.* 1993;325-333.

Journal Article on the Internet

Kafuko JM, Zirabumuzaale, C. Bagenda D. Rational drug use in rural health units of Uganda: Effect of National Standard Treatment guidelines on rational drug use (Unpublished report). 1994. available at http://archives.who.int/icium/icium1997/posters/2f3_text.html accessed on 27th September 2013.

References from Books and Monograph

Personal author

Haque M.M. abc of research methodology and biostatistics, Department of Biochemistry, 2009. BSMMU, Dhaka.

Editor (s) as author

Basmajian JV, Slonecker CE, editors. Grant's method of anatomy. A clinical problem-solving approach. 11th ed. New Delhi : BI Waverly Pvt Ltd. 1997;180-183.

Organization as author and publisher

World Health Organization. Revised 1990 estimates of maternal mortality : A new approach by WHO and UNICEF. Geneva: World Health Organization. 2003;132-151.

Chapter in a book

Ford HL, Sclafani RA, Degregori J. Cell cycle regulatory cascades. In: Stein GS, Pardee AB, editors. Cell cycle and growth control: Biomolecular regulation and cancer. 2nd ed. Hoboken (NJ): Wiley-Liss. 2004; 42-67.

Article from an encyclopedia: No author

Mental disorders and their treatment. In: The new encyclopaedia Britannica. 5th ed. Chicago (IL): Encyclopaedia Britannica. 1987;23:956-975.

Conference proceedings

Khalifa ME, Elmessiry HM, ElBahnasy KM, Ramadan HMM. Medical image registration using mutual information similarity measure. In: Lim CT, Goh JCH, editors. Icbme 2008: Proceedings of the 13th International Conference on Biomedical Engineering. 2008 Dec 3-6; Singapore. Dordrecht: Springer. 2009;151-155.

Conference paper

Yamane Y. The effect of spirulina on nephrotoxicity in rats. Presented at Annual Symposium of the Pharmaceutical Society of Japan at Chiba University. 1988 April 15; Japan.

Reference from dissertation or thesis

Siddika AN. Does Antimicrobial Prescribing of BSMMU Hospital comply to its' Antibiotic Guideline? MPhil. Thesis, Dhaka: Bangabandhu Sheikh Mujib Medical University. 2012.

Newspaper Article

O'Leary C. Vitamin C does little to prevent winter cold. *The West Australian.* 2005 Jun 29.

Acknowledgements

This section may be used to acknowledge the help of those who (Individuals, organizations or bodies) do not qualify for authorship or to acknowledge funding, donated resources, or significant material contributions to the research. It should be limited to not more than 50 words.

Conflict of Interest

All authors of the submitted manuscript are requested to disclose any actual or potential conflict of interest including any financial, personal or other relationships with other people or organizations within two years of beginning the submitted work that could inappropriately influence, or be perceived to influence, their work. Please collect the form, fill and submit by each author separately.

Editorial: It's an invited article based on current affairs of medical science with any discipline. Maximum length of editorial may be within 1500- 1200 words.

Original / Research Article : A Original / Research, observational and experimental article should be divided into the following sections with heading (Introduction, Materials and Methods, Results, Discussion, Limitation, Conclusion, Recommendations, Acknowledgement, Disclosure and References). Length of the text may be within 3500-4500 words (Excluding Abstract, table, figure and references).

Special Article/ Short Communication: It is a medical based text in any disciplines. Maximum length of text may be within 2500-3000 words (Excluding abstract, table, figure, Reference). The total numbers of reference will not be more than 10.

Review Article: It is a prestigious article, which is divided into following sections with headings (introduction, search strategy, discussion, conclusion, and disclosure). Review article should not generally exceed 8500 words.

Case Report: Text of the case report is divided into following sections (introduction, case report, images, discussion, figure/legend, conclusion, and disclosure). Maximum length of text may be within 2000- 2500 words (Excluding abstract, reference).

Letter to the Editor: Should be brief and to the point with 500-600 word only.

Authorship: The corresponding author is responsible for all the information of these forms. He/she will confirm that all the authors have read the manuscript before submission. The following person(s) will be authors:

- Concept research question and study design
- Data collection or processing

Any person only involved in writing the manuscript or analyzing the data will not be the author or corresponding author particularly in research article.

Manuscript Submission

The manuscript should be accompanied by a cover letter, a declaration signed by author and other co-authors include a statement of financial or other relationships that might lead to a conflict of interests, a declaration that the work has not been published or submitted for publication elsewhere. It should be clearly mentioned if manuscript is a whole or part of thesis or dissertation. The declaration must be collected from the office of Editor-In-Chief or AMCC's website.

Reprints for the Author(s)

One copy of each published article will be provided to the all authors of respected article free of cost. Additional reprints may be obtained by prior request and only on necessary payment.

Subscription Request Should be Sent to:

Executive Editor
Journal of Army Medical College Chattogram
Chattogram Cantonment, Baizid,
Chattogram-4210
Bangladesh.
Email: jamcc.bd@gmail.com

Communication for Manuscript Submission

Communication information for all correspondence is always printed in the title page of the journal. Any additional information or any other inquiry relating to submission of the article, the Executive Editor or the Journal office may be contacted.

Privacy Statement

The names and email addresses entered in this journal site will be used exclusively for the stated purposes of this journal and will not be made available for any other purpose or to any other party.

Plagiarism Detection

Before peer review, all the submitted manuscripts are screened by the Plagiarism detector, hence all the authors are requested to avoid the overlapping or similar text from published articles as a result originality to be maintained. According to the International Committee of Medical Journal Editors (ICMJE) less than 20% of plagiarism are accepted for submitted manuscript (excluding references).



ESTD 2014

ISSN 2663-778X

BMDC Approved

Journal of Army Medical College Chattogram (JAMCC)

Chattogram Cantonment, Chattogram, Bangladesh.
Phone : 88-031-2580425, Email : jamcc.bd@gmail.com
www : amcc.edu.bd/journal

DECLARATION

I/We the undersigned, solemnly affirm that I/We have read and approved the article under the title

submitted for publication in the JAMCC

I/We further affirm that :

1. The article mentioned above has not been published before nor submitted for publication in any form, in an other journal by me / an of us
2. the authorship of this article will not be contested by anybody else whose names is/are not listed here
3. I/We individually / jointly share the responsibility for the integrity of the content of the manuscript
4. Each of us have generated / contributed to part of the intellectual content of the paper
5. Conflict of interest (If any) has been disclosed
6. We also agree to the authorship of this article in the following sequence :

Authors name (In sequence)

Signature

1.	-----	-----
2.	-----	-----
3.	-----	-----
4.	-----	-----
5.	-----	-----
6.	-----	-----

Correspondence : Dr.-----

Email : -----

Cell : -----

Important notes :

1. All the authors are requested to sign this form independently in the sequence mentioned
2. Each author should be able to defend publicly in the scientific community, that intellectual content of the paper for which he / she can take responsibility
3. If the authorship is contested at any state of publication the article will not be processed till the issue is resolved



