ISSN-0301-035X(Print)
2219-1607(Online)

Bangladesh Medical Journal

Official Organ of Bangladesh Medical Association

Vol. 53 No. 3 September 2024

Original Articles

Review Article

BMA Executive Committee for The Year 2017-2018

Sl.	Name	Name of Post
1.	Dr. Mustafa Jalal Mohiuddin	President
2.	Dr. Kanak Kanti Barua	Vice President (Dhaka City)
3.	Dr. Jamal Uddin Khalifa	Vice President (Dhaka Division)
4.	Dr. Md. Kamrul Hassan (Salim)	Vice President (Barisal Division)
5.	Dr. Sheikh Mohammed Shafiul Azam	Vice President (Chittagong Division)
6.	Dr. Sk. Baharul Alam	Vice President (Khulna Division)
7.	Dr. Md. Mostafa Alam (Nannu)	Vice President (Rajshahi Division)
8.	Dr. Md. Delwar Hossain	Vice President (Rangpur Division)
9.	Dr. Murshed Ahmed Chowdhury	Vice President (Sylhet Division)
10.	Dr. A N M Fazlul Hoq Pathan	Vice President (Mymensingh Division)
11.	Dr. Md. Ehteshamul Huq Choudhury	Secretary General
12.	Dr. Mohd. Zahid Hussain	Treasurer
13.	Dr. Md. Kamrul Hasan (Milon)	Joint Secretary General
14.	Dr. Md. Tarique Mehedi Parvez	Organizing Secretary
15.	Dr. Shahryar Nabi (Shakil)	Scientific Secretary
16.	Dr. Md. SK. Shahid Ullah	Office Secretary
17.	Dr. Md. Mahbubur Rahman (Babu)	Publicity & Public Relation Secretary
18.	Dr. Sohel Mahmud	Social Welfare Secretary
19.	Dr. Purabi Rani Debnath	Cultural & Entertainment Secretary
20.	Dr. Kazi Shafiqul Halim (Zimmu)	Library & Publication Secretary
21.	Dr. Md. Abul Hashem Khan	International Affairs Secretary
22.	Dr. Mohammed Salim	Member, Central Executive Committee
23.	Dr. Md. Abdul Aziz	Member, Central Executive Committee
24.	Dr. Md. Moniruzzaman Bhuiyan	Member, Central Executive Committee
25.	Dr. Mohammad Mushtuq Husain	Member, Central Executive Committee
26.	Dr. Md. Jamal Uddin Chowdhury	Member, Central Executive Committee
27.	Dr. Md. Shafiqur Rahman	Member, Central Executive Committee
28.	Dr. Md. Sharfuddin Ahmed	Member, Central Executive Committee
29.	Dr. Qazi Shahidul Alam	Member, Central Executive Committee
30.	Dr. Md. Abu Raihan	Member, Central Executive Committee
31.	Dr. M Nazrul Islam	Member, Central Executive Committee
32.	Dr. Zahurul Huq Sachchu	Member, Central Executive Committee
33.	Dr. Md. Abu Yusuf Fakir	Member, Central Executive Committee
34.	Dr. Ehsanul Kabir Joglul	Member, Central Executive Committee
35.	Dr. Md. Zulfikar Ali (Lenin)	Member, Central Executive Committee
36.	Dr. Uttam Kumar Barua	Member, Central Executive Committee
37.	Dr. Chitta Ranjan Das	Member, Central Executive Committee
38.	Dr. Md. Jabed	Member, Central Executive Committee
39.	Dr. Hasanur Rahman	Member, Central Executive Committee
40.	Dr. Md. Babrul Alam	Member, Central Executive Committee
41.	Dr. Hossain Muhammad Mustafijur Rahman	Member, Central Executive Committee
42.	Dr. Muhammad Harun-Ar-Rashid	Member, Central Executive Committee
43.	Dr. Mahmud Hasan	Member, Central Executive Committee
44.	Dr. M Iqbal Arslan	Member, Central Executive Committee
45.	Dr. Syed Atiqul Haq	Chairman, Bangladesh Medical Journal & Member, Central Executive Committee
46.	Dr. Rokeya Sultana	Member, Central Executive Committee
47.	Dr. Badiuzzaman Bhuiyan (Dablu)	Member, Central Executive Committee
48.	Dr. Kamrul Hasan Khan	Member, Central Executive Committee
49.	Dr. Momenul Haq	Member, Central Executive Committee
50.	Dr. Md. Shahidullah Sikder	Member, Central Executive Committee
51.	Dr. Pabitra Kumar Debnath	Member, Central Executive Committee

Information for Authors

Submission of manuscripts:

Papers are accepted for publication with an understanding that they are submitted solely to the Bangladesh Medical Journal and are subject to peer review and editorial revision. Statement and opinions expressed in the papers, communications and letters herein are those of author(s) and not necessarily of the editors or publishers. Three hard copies along with a soft copy should be sent to the executive editor of Bangladesh Medical Journal, BMA Bhaban, 15/2, Topkhana Road, Dhaka-1000.

Bangladesh Medical Journal publishes the following:

Full papers, review articles, letters to the editors, debate and opinion papers, editorials, on being a doctor, medical news, medical jokes/poem.

Letters to the editor – letters are invited that discuss, criticize or develop themes on national or international issues related to doctors, medical science or medical profession. Clinical observations, original research presented in a research letter format or case reports or series may be included in letters to the editors. Comments on papers published in Bangladesh Medical Journal are also encouraged. Acceptance will be at the discretion of the editorial board, and editorial changes may be required. Wherever possible, letters from responding authors will be included in the same issue.

Form of full papers submitted for publication:

Full papers should be no more than 4000 words. The onus of preparing a paper in a form suitable for sending to press lies with the author. Authors are advised to consult a current issue in order to make themselves familiar with the journal regarding typographical and other conventions, layout of tables etc. Authors are encouraged to consult the latest guidelines produced by the International Committee of Medical Journal Editors (ICMJE), which contains a lot of useful generic information about preparing scientific papers (http://www.icmje.org/manuscript_a.html) Manuscripts should be typed on one side of white good quality A4 size paper, with wide margins of at least 2cm and using double space throughout, the preferred font being Garamond size 12. Words at the end of lines should not be hyphenated unless hyphens are to be printed. Page numbering is required. Spelling should generally be that of the Concise Oxford Dictionary, 11th ed. Oxford: Clarendon press. Each component of the manuscript should begin on a new page in the sequence of title page, abstract, text, reference, tables and legends for illustration. The title page should include the title of the paper, name of the author(s), and name of the departments(s) to which the work should be attributed. The first six authors of a work should be named, followed by "et al." if there are more than six.

The unstructured abstract of 150 words should follow the title page. It should provide the context or background for the study and should state the study's purpose, basic procedures (selection of study subjects or laboratory animals, observational and analytical methods), main findings (giving specific effect size and their statistical significance, if possible), and principal conclusion.

The text should be presented in the form of Introduction, Methods, Results and Discussion.

References:

These should be given in the text using the Vancouver system. They should be numbered consecutively in the order in which they first appear in the text using superscript. If a reference is cited more than once the same number should be used each time. References cited only in tables and figures and not in the text should be numbered in sequence from the last number used in the text and in the order of mention of the individual tables and figures in the text. At the end of the paper, on a page(s) separate from the text, references should be listed in numerical order. The journal adheres closely to the Vancouver style of references (see http:// www.nlm. nih.gov/bsd/uniform_ requirements. html, updated 2013).

Sample references are given below –

1. Standard Journal Article

List the first six authors followed by et al:

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002 Jul 25; 347(4): 284-7

As an option, if a journal carries continuous pagination throughout a volume (as many medical journals do) the month and issue number may be omitted:

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002; 347:284-7

More than six authors:

Rose ME, Huerbin MB, Melick J, Marion DW, Palmer AM, Schiding JK, et al. Regulation of interstitial excitatory amino acid concentrations after cortical contusion injury. Brain Res. 2002;935(1-2):40-6

Optional addition of a database's unique identifier for the citation:

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002 Jul 25;347(4):284-7. PubMed PMID: 12140307

Organization as author:

Diabetes Prevention Program Research Group.

Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. Hypertension. 2002;40(5): 679-86 No author given:

21st century heart solution may have a sting in the tail. BMJ. 2002;325(7357):184

Volume with supplement:

Geraud G, Spierings EL, Keywood C. Tolerability and safety of frovatriptan with short- and long-term use for treatment of migraine and in comparison with sumatriptan. Headache. 2002;42 Suppl 2:S93-9.

Issue with supplement:

Glauser TA. Integrating clinical trial data into clinical practice. Neurology. 2002;58(12 Suppl 7):S6-12.

Article published electronically ahead of the print version: Yu WM, Hawley TS, Hawley RG, Qu CK. Immortalization of yolk sac-derived precursor cells. Blood. 2002 Nov 15; 100(10):3828-31. Epub 2002 Jul 5.

2. Books and Other Monograph Personal author(s):

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

3. Other Published Material MaterialNewspaper article:

Tynan T. Medical improvements lower homicide rate: study sees drop in assault rate. The Washington Post. 2002 Aug 12; Sect. A:2 (col. 4).

Dictionary and similar references:

Dorland's illustrated medical dictionary. 29th ed. Philadelphia: W.B. Saunders; 2000. Filamin; p. 675.

4. Unpublished Material (In press or Forthcoming:)

Tian D, Araki H, Stahl E, Bergelson J, Kreitman M. Signature of balancing selection in Arabidopsis. Proc Natl Acad Sci U S A. Forthcoming 2002.

5. Journal Article on the Internet

Abood S. Quality improvement initiative in nursing homes: the ANA acts in an advisory role. Am J Nurs [Internet]. 2002 Jun [cited 2002 Aug 12];102(6):[about 1 p.]. Available from: http://www.annals.org/ cgi/reprint/ 145/1/62.pdf

Tables :

Table should have brief title for each, should be numbered consecutively using Roman numerals and be cited in the text in consecutive order. Internal horizontal and vertical rules should not be used.

Illustration :

All drawings should be made with black Indian ink on white paper. Photographs and photomicrographs should be supplied as glossy black and white prints unmoundted. All photographs, graphs and diagrams should be referred to as figures numbered consecutively in the text in Arabic numerals.

Abbreviation :

Except for units of measurement, abbreviations are discouraged. Consult scientific style and forma. The CBE manual for authors, editor and publishers (Sixth edition New York: Cambridge University Press, 1994) for lists of standard abbreviation. The first time an abbreviation appears, it should be preceded by the words for which it stands.

Drug names :

Generic name should generally be used. When proprietary brands are used in research, include the brand name in parentheses in the methods section.

Permission :

Materials taken from other source must be accompanied by a written statement from both author and publishers giving permission to the journal for reproduction. Obtain permission in writing from at least one author of papers that is still in press, unpublished data and personal communications.

The editor of Bangladesh Medical Journal reserves the customary right to style and if necessary shortens the material accepted for publication and to determine the priority and time of publication. Editor assumes that the manuscript submited by the author is based on honest observations. It is not a task of the editor to investigate scientific fraud paper.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.83413

Original Article

Risk and Benefit of Post-operative Double J Stent use after URS and ICPL

*Rahman MH[1], Hossain F[2], Rahman S[3]

Abstract

One of the most important tools in urology for a range of treatments is Double J Stent (DJS). By keeping the ureter open, these stents reduce edema and allow for possible injury. DJS after Ureterorenoscope (URS) with Intracorporeal pneumatic lithotripsy (ICPL) is debatable. However, a number of short- and long-term challenges have been linked to the DJS; for example, hematuria, infection, discomfort, and stent syndrome are all short-term complications. Total 98 individuals with ureteral calculi who visited the Department of Urology during the study period comprised the study population. The Department of Urology at BSMMU, Bangladesh, conducted this prospective comparative study over the period of a year, from November 2022 to November 2023. The purpose of this study was to assess the benefits and drawbacks of post-operative DJS following URS surgery with ICPL. Patients were enrolled in this study after obtaining their written consent. Later, they were split up into two groups. After URS+ICPL, patients in Group A received DJS, but those in Group B did not. Interviews were conducted with each patient to learn more about their clinical and demographic characteristics. Each patient's detailed medical history was documented, including the size and location of the stones, stone free rate, pain and complications as well as the duration of the procedure and hospital stay. DJS following URS+ICPL was evaluated based on stone free rate, ambulatory, pain and complications. Data were analyzed by statistical package for social sciences (SPSS) version 22.0. Mean age of the patients was 39.88 ± 11.44 years in DJS group and 38.10 ± 10.24 years in no DJS group. Males (62%; group-A 32%, group-B 29%) were predominant than females (38%; group-A 17%, group-B 20%) in both the two groups but there was no significant difference between the two groups. In both groups, the percentages of DM (12.2% vs 14.3%) and HTN (22.4% vs 18.4%) were nearly equal. There was no significant difference in BMI, Systolic BP and Diastolic BP between the two groups. In both the DJS and no DJS groups, the left-sided stones outnumbered the right-sided ones. In both the DJS and no DJS groups, the highest percentage of stones were found in the lower calix (40.8% vs. 42.9%), followed by the middle calix (36.7% vs. 38.8%) and the upper calix (22.4% vs. 18.4%). The stone sizes in the DJ and non-DJ stent groups were 22.67 ± 4.16 mm and 20.08 ± 2.57 mm, respectively. Compared to the no DJS group (87.8%), the stone clearance was significantly lower in the DJS group (71.4%). Compared to the no DJS group (59.2%), the ambulatory rate was significantly lower in the DJS group (38.8%). The DJS group spent more times (1.32 ± 0.89 days) in the hospital, compared to less times (1.10 ± 0.30 days) in the non-DJS group (p>0.05). The group with a DJS experienced considerably more complications overall (42.9%) than the non-DJS group (22.4%). Hematuria was less frequent (8.2%) in the non-DJS group and more frequent (18.4) in the DJS group (p>0.05). Both fever (14.3%) and pain (14.3%) experienced in non-DJS groups is equal; where 24.5% fever and 42.9% pain experienced respectively, in the DJS and non-DJS groups (p<0.05). Steinstrasse was 10.2% in DJS group and 6.1% in no non-DJS group (p>0.05). Following URS and ICPL, DJ stenting significantly reduces stone clearance and ambulation rates compared to no stenting, and is associated with increased complications. Omitting DJ stenting after ureteroscopy appears safe.

Keywords: *Double j stent, ureteroscopy, intracorporeal pneumatic lithotripsy.*

1. *Professor Dr. Md. Habibur Rahman, Professor, Department of Urology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. Email: dulalro@yahoo.com
2. Dr. Faruk Hossain, Associate Professor, Department of Urology, BSMMU, Dhaka
3. Dr. Selina Rahman, Assistant Professor, Dept. of Radiology and Imaging, BSMMU, Dhaka.

* For correspondence

INTRODUCTION

Urolithiasis is the most common urological condition, with a 10-15% prevalence and a 50% recurrence rate.[1] This percentage is far higher in some high-income countries and has risen by more than 37% during the last two decades.[2] Ureteric obstruction, renal colic, infection, and hydronephrosis are the most prevalent complications of ureteral stones. Urinary stones, one of the most common urological disorders, require active treatment due to their high prevalence, recurrence rates, and a variety of implications.[3, 4] There are several therapeutic procedures available for the treatment of ureteral stones, with the goal

of removing the stone completely while minimizing patient morbidity. The most commonly performed techniques include shock wave lithotripsy (SWL), ureteroscopy (URS), percutaneous nephrolithotripsy, laparoscopic ureterolithotomy, and open ureterolithotomy.[5] The therapy of urinary stone disease has changed substantially in the last two decades. Minimally invasive and noninvasive procedures, such as ESWL and URS with ICPL, have largely replaced open surgery.

The management of renal and ureteral stones has changed substantially in recent years. The increased use of ureteroscopy (URS) is owing to technology developments such as endoscope reduction and improved deflection. The European Association of Urology (EAU) now recommends flexible ureteroscopy (fURS) as the first-line treatment for renal stones smaller than 20 mm. It is also effective in treating lower pole renal calculi that are resistant to extracorporeal shockwave lithotripsy (ESWL). For renal stones greater than 20 mm, URS is recommended as a second-line treatment.[6]

Since their introduction in 1967 by Zimskind et al.[7], Double-J (DJ) stents have become one of the most essential and commonly used tools in urology for a variety of therapies. These stents keep the ureter open, minimizing edema and allowing for potential damage. As a result, it is advised as a postoperative treatment technique for patients with ureteric calculi, ureteric stricture, retroperitoneal tumors or fibrosis, ureteropelvic junction obstruction, or any other iatrogenic ureteral injury. The DJ stent is typically the first line of treatment for people with obstructive uropathy caused by urinary calculi.

Urologists continue to question the use of double J stenting (DJS) following URS.[8,9] According to the most recent edition of the urolithiasis EAU recommendation, stenting following URS is optional in uncomplicated URS with full stone removal. DJS is used after URS to prevent occlusion from a residual fragment or postoperative edema. It may also help to avoid ureteral stenosis following surgery. Following ureteroscopy, there is a 1% probability of ureteral stenosis. It is enhanced in cases of prolonged surgical time, ureteroscope diameter more than 9.5F, ureteral perforation, or impacted calculi[10] and may go undetected, resulting in renal function difficulties.[11] These devices are not inconsequential, though, as a patient's quality of life may be impacted by clinical symptoms such as urgency, hematuria, and social and sexual repercussions. In 2003, Joshi et al.[13] discovered that 80% of stent-related discomfort was caused by daily disruption of daily activities, 80% by urinary symptoms, and 32% by sexual dysfunction. Other investigations found that morbidity ranged between 50 and 80%.[12, 13]

Additionally, stent migration, encrustation, pyelonephritis, and forgotten stent might develop following stent insertion.[14] As a result, DJS following URS is still contested among urologists.[8,9]

However, the use of DJ stents has been linked to a variety of complications. Zimskind et al.[7] report that DJ stents have also been connected to complications. The DJ stent has been associated to a variety of short- and long-term complications. Infection, hematuria, pain, and stent syndrome are all short-term complications. Long-term stent retention can cause encrustations, stone formation, stent fractures and blockages, hydronephrosis, and, in certain circumstances, renal function loss. Encrustation on the DJ stent becomes increasingly likely as it is placed in place for an extended length of time.[15] Stent encrustation rates are 9.2%, 47.5%, and 76.3%, respectively, if the stent is left in place for 6 weeks, 6-12 weeks, and more than 12 weeks.[16] The DJ stent should be changed or removed between 6 weeks to 6 months.[17]

Lithotripsy is a procedure for dissolving kidney, bladder, or ureter stones. Lithotripsy destroys hardened masses such as kidney stones, bladder stones, and ureter stones. Intracorporeal Pneumatic Lithotripsy (endoscopic lithotripsy) is an alternative treatment option if Extracorporeal Lithotripsy fails. Pneumatically driven projectiles impact a metallic probe placed endoscopically on a calculus inside the Intracorporeal Pneumatic Lithotripter. The probe is placed on the stone after passing through a rigid endoscopic canal. Ballistic energy fractures the stone (Calculus) into small pieces. Endoscopic basket (Stone Basket) or grasper (Forceps) will be utilized to collect pieces. These devices operate best when utilized through a rigid endoscope, and they may cause stone migration during therapy.

MATERIALS AND METHODS

This prospective comparative study was carried out in the Department of Urology at BSMMU, Bangladesh, between November 2022 and November 2023. The study population consisted of 98 patients with ureteral calculi who visited the Department of Urology during the study period and age more than or equal to 18 years and both sexes. Patients with renal failure, multiple stones without stone analysis report, stones with technically difficult in passing the ureteroscopy, disagreed to participate in this study or

denied to give consent were excluded from this study. This study was carried out to evaluate the benefits and drawbacks of post-operative DJS after URS surgery with ICPL. Patients' signed agreement was obtained before they were enrolled in the trial. They were later divided into two groups. Patients in Group A experienced DJS following URS+ICPL, whereas those in Group B did not. Interviews were conducted with each patient to learn more about their clinical and demographic characteristics. Each patient's detailed medical history was documented, including the size and location of the stones, stone free rate, pain and complications as well as the duration of the procedure and hospital stay. DJS following URS+ICPL was evaluated based on stone free rate, ambulatory, pain and complications. Data were analyzed by statistical package for social sciences (SPSS) version 22.0. Ethical permission was obtained from the institutional review board, in compliance with the Declaration of Helsinki. Patients were enrolled in this study following the acquisition of written consent from each individual. The preoperative evaluation comprised urinalysis, a plain radiograph of the kidneys, ureters, and bladder (KUB), and ultrasonography (USG) of the KUB. An intravenous urogram (IVU) and non-contrast computed tomography (NCCT) of the abdomen were performed on each patient as per our protocol. Urine sterility was verified before to each intervention, and antibiotics were administered when deemed necessary. Patients received general anesthesia and prophylactic antibiotics during the induction of anesthesia. URS was conducted with a 7 Fr Karl Storz semi-rigid uretero-renoscope. A 0.035-inch firm Terumo security wire and a Flexor Ureteral Access Sheath were utilized at the surgeon's choice. The position was regulated utilizing fluoroscopy. An ICPL was employed for stone fragmentation (200 to 550 µm fiber) and a basket was utilized for stone evacuation if required. Each surgery lasted 90 minutes or less to reduce complications. Ultimately, 24 cm and 7 Fr silicone DJS were utilized as per the instructions for patients in Group A. The stent was extracted 1 to 6 weeks post-intervention, either under local anesthetic at a consultation or during the subsequent procedure. Each patient was administered a non-steroidal anti-inflammatory medicine (NSAID) for three days following the intervention. An X-ray was conducted on the first postoperative day and again one-month post- procedure during the stent removal.

Statistical analyses were performed using SPSS 22.0 software (SPSS, Chicago, IL, USA). Numerical data was presented as mean and SD, where categorical data was presented as frequency with percentage. Numerical data was analyzed using unpaired t test and paired t test whereas categorical data was analyzed using Chi-Square test. Statistical significance was considered as $P \leq 0.05$.

RESULTS

Table I displays the distribution of demographic profile, co-morbidity and BMI of the patients; here Mean age of the patients was 39.88±11.44 years in DJS and 38.10 ± 10.24 years in non-DJS group. Males were 61 (62%) and females were 37 (38%) among them 32 (65.3%) male and 17 (34.7%) were in DJS group, where 29 (59.2%) male and 20 (40.8%) female were in non-DJS group. Males were predominant in both the two groups but there was no significant difference between the two groups. DM (12.2% vs 14.3%) and HTN (22.4% vs 18.4%) was almost similar number in both groups; then there was no significant difference in BMI. No significant difference was also found of systolic BP and diastolic BP between the two groups.

Table I: Distribution of demographic profile, co-morbidity and BMI of the patients (N=98)

		DJ stent	No DJ stent	p-value
Age (years)	21 - 30	13 (26.5)	14 (28.6)	
	31 - 40	15 (30.6)	18 (36.7)	
	41 - 50	11 (22.4)	9 (18.4)	[a]0.420
	51 - 60	10 (20.4)	8 (16.3)	
	Mean ± SD	39.88 ± 11.44	38.10 ± 10.24	
Gender	Male	32 (65.3)	29 (59.2)	[b]0.532
	Female	17 (34.7)	20 (40.8)	
Co-morbidity	DM	6 (12.2)	7 (14.3)	[b]0.616
	HTN	11 (22.4)	9 (18.4)	
Systolic BP (mmHg)		124.90 ± 13.83	124.49 ± 10.62	[a]0.870
Diastolic BP (mmHg)		89.49 ± 14.55	88.88 ± 11.65	[a]0.819
BMI (kg/m^2)		28.21 ± 5.54	26.61 ± 4.05	[a]0.106

[a]Unpaired t test and [b]Chi-Square test was done

Table II comprises the distribution of location and size of the stones among the patients; among the patients DJS group 22 (44.9%) and 27 (55.1%) were involved in right and left side respectively; however 24 (49.0%) and 25 (51.0%) in non-DJS group. Thus 11 (22.4%), 18 (36.7%) and 20 (40.8%) stones were located in upper, middle and lower calix in DJS group respectively, where 9 (18.4%), 19 (38.8%) and 21 (42.9%) in non-DJS group. The mean stone size was 22.67 ± 4.16 mm and 20.08 ± 2.57 mm in DJS and non-DJS group respectively (p<0.05).

Table II: Distribution of location and size of the stones among the patients (N=98)

	DJ stent	No DJ stent	p-value
Involved side			
Right	22 (44.9)	24 (49.0)	[b]0.686
Left	27 (55.1)	25 (51.0)	
Location of stone			
Upper calix	11 (22.4)	9 (18.4)	[b]0.882
Middle calix	18 (36.7)	19 (38.8)	
Lower calix	20 (40.8)	21 (42.9)	
Stone Size (mm)	22.67±4.16	20.08±2.57	[a]<0.001

[a]Unpaired t test and [b]Chi-Square test was done

Table III shows the outcome of the after procedure among the patients; here the stone clearance rate was 35 (71.4%) in DJS group, where 87.8% in non-DJs group and this difference was statistically significant. Ambulatory rate was 19 (38.8%) in DJS group, where 29 (59.2%) in non-DJS group and this difference was also statistically significant. The mean duration of hospital stay was 1.32 ± 0.89 days in DJS group and 1.10 ± 0.30 days in non-DJS group (p>0.05).

Table III: Outcome of the after procedure among the patients (N=98)

Stone clearance rate	DJ stent	No DJ stent	p-value
Stone clearance rate	35 (71.4)	43 (87.8)	a0.045
Ambulatory rate	19 (38.8)	29 (59.2)	a0.043
Hospital stay (days)	1.32 ± 0.89	1.10 ± 0.30	b0.101

[a]Unp aired t test and [b]Chi-Square test was done

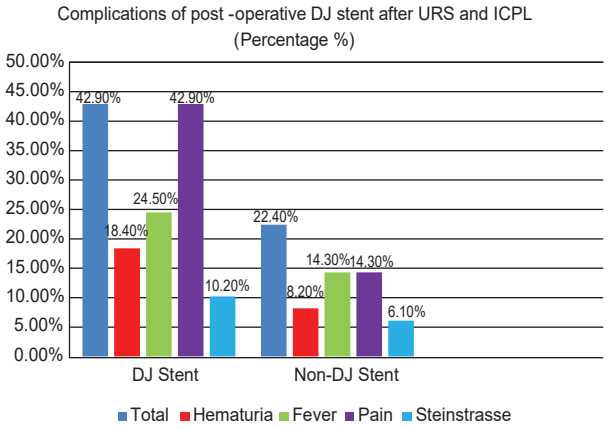


Figure- 1: Complication due to post-operative DJ stent use after URS and ICPL

Figure 1 illustrates the complication due to post-operative DJ stent use after URS and ICPL, here, total complications in DJ stent group was 42.9% and non-DJ stent group 22.4%; this difference was statistically significant. Pain was 42.9% in DJ stent group and 14.3% in non-DJ stent group (p<0.05); this difference was also statistically significant. Hematuria, Fever and Steinstrasse were 18.4%, 24.5% and 10.2% in DJ stent group respectively; where Hematuria, Fever and Steinstrasse were 8.2%, 14.3% and 6.1% in non-DJ stent group respectively. *(Chi-Square test was done)*

DISCUSSION

In this study, the average age of patients in the DJ stent group was 39.88 ± 11.44 years, while it was 38.10 ± 10.24 years in the group without DJ stents. In comparison, Pogula et al.[18] reported mean ages of 43.8 years for the DJ stent group and 46.4 years for the non-stent group. Similarly, Segalen et al.[19] included patients with mean ages of 56.12 years and 54.7 years in the respective groups. Therefore, the participants in our study were relatively younger than those in the previous studies

Although males outnumbered females in both groups, the difference was not statistically significant. Male predominance was also observed in the study of Pogula et al.[18], Khan et al.[20] and Segalen et al.[19].

DM (12.2% vs 14.3%) and HTN (22.4% vs 18.4%) was almost similar number in both groups. There was no significant difference in BMI, Systolic BP and Diastolic BP between the two groups.

The left side stones predominated over right-sided stones in both DJ stent and no DJ stent group in this study. Similar

finding was revealed in the study of Pogula et al.[18]. In contrast, Khan et al.[20] revealed that right side stones were predominant than left side stones. Maximum stones were located in lower calix in both DJ and no DJ stent group (40.8% vs 42.9%) followed by middle calix (36.7% vs 38.8%) and upper calix (22.4% vs 18.4%). Similar stone location was observed in the study of Segalen et al.[19]. The stones included 9 upper (23.7%), 11 mid (28.9%), and 18 lower (47.4%).[21]

Stone size was 22.67 ± 4.16 mm and 20.08 ± 2.57 mm in DJ and no DJ stent group respectively. Stone size was 18.3 ± 14.9 in DJ stent group and 9.4 ± 5.2 in no DJ stent group.[19]

Stone clearance was notably lower in the DJ stent group (71.4%) compared to the non-stented group (87.8%). While stenting following ureteroscopy is often recommended to reduce the risk of ureteral stricture, aid in the passage of stone fragments, and support ureteral healing, several recent prospective randomized trials have found no significant difference in stone-free rates between patients who received stents and those who did not.[12,22] Ambulation rates were also significantly lower in the DJ stent group (38.8%) than in the no stent group (59.2%), a finding consistent with the study by Segalen et al.[19] Additionally, the duration of hospital stay was longer for patients with DJ stents (1.32 ± 0.89 days) compared to those without stents (1.10 ± 0.30 days), although this difference was not statistically significant ($p > 0.05$).

Overall complication was significantly higher in DJ stent group (42.9%) than no DJ stent group (22.4%). Overall complication was 20.6% and 18.0% in DJ stent and no DJ stent group respectively.[18]

In the DJ stent group, hematuria was observed in 18.4% of patients compared to 8.2% in the non-DJ stent group, though the difference was not statistically significant ($p > 0.05$). Similarly, fever occurred in 24.5% of DJ stent patients versus 14.3% in the non-stent group ($p > 0.05$). Although both hematuria and fever were more frequent in the DJ stent group, neither showed a significant difference between the two groups.[20] Pain was reported in 42.9% of DJ stent patients and only 14.3% of non-stent patients, a statistically significant difference ($p < 0.05$), a finding consistent with Khan et al.[20]. Steinstrasse was observed in 10.2% of the DJ stent group and 6.1% of the non-stent group ($p > 0.05$). While hematuria, fever, and steinstrasse were more common in the DJ stent group, none of these differences reached statistical significance.[18]

CONCLUSION

DJ stenting following URS and ICPL resulted in a significantly reduced stone clearance rate and ambulatory rate compared to no DJ stenting. DJ stenting after URS and ICPL resulted in significantly more complications than DJ stenting without URS and ICPL. No stenting after ureteroscopy appears to be safe for patients.

REFERENCES

1. López M, Hoppe B. History, epidemiology and regional diversities of urolithiasis. Pediatric nephrology. 2010;25:49-59.
2. Stamatelou KK, Francis ME, Jones CA, Nyberg Jr LM, Curhan GC. Time trends in reported prevalence of kidney stones in the United States: 1976–1994. Kidney international. 2003;63(5):1817-23.
3. Papadoukakis S, Stolzenburg JU, Truss MC. Treatment strategies of ureteral stones. EAU-EBU update series. 2006;4(5):184-90.
4. Ahn SH, Oh TH, Seo IY. Can a dual-energy computed tomography predict unsuitable stone components for extracorporeal shock wave lithotripsy?. Korean Journal of Urology. 2015;56(9): 644.
5. Rabani SM, Moosavizadeh A. Management of large proximal ureteral stones: a comparative clinical trial between transureteral lithotripsy (TUL) and shock wave lithotripsy (SWL). Nephro-urology monthly. 2012; 4(3):556.
6. Türk C, Skolarikos A, Neisius A. EAU Guidelines on Urolithiasis. 2019. Available at https:// uroweb. org/guideline/urolithiasis.
7. Zimskind PD, Fetter TR, Wilkerson JL. Clinical use of long-term indwelling silicone rubber ureteral splints inserted cystoscopically. The Journal of urology. 1967;97(5):840-4.
8. Foreman D, Plagakis S, Fuller AT. Should we routinely stent after ureteropyeloscopy?. BJU international. 2014;114:6-8.
9. Keeley Jr FX and Timoney AG. Routine stenting after ureteroscopy: think again. European urology. 2007;52(3):642-4.
10. Johnson DB, Pearle MS. Complications of ureteroscopy. Urologic Clinics. 2004;31(1):157-71.

11. Weizer AZ, Auge BK, Silverstein AD, Delvecchio FC, Brizuela RM, Dahm P, Pietrow PK, Lewis BR, Albala DM, Preminger GM. Routine postoperative imaging is important after ureteroscopic stone manipulation. The Journal of urology. 2002;168(1):46-50.

12. Byrne RR, Auge BK, Kourambas J, Munver R, Delvecchio F, Preminger GM. Routine ureteral stenting is not necessary after ureteroscopy and ureteropyeloscopy: a randomized trial. Journal of endourology. 2002;16(1):9-13.

13. Joshi HB, Stainthorpe A, MacDonagh RP, Keeley FX, Timoney AG. Indwelling ureteral stents: evaluation of symptoms, quality of life and utility. The Journal of urology. 2003;169(3):1065-9.

14. Singh I, Gupta NP, Hemal AK, Aron M, Seth A, Dogra PN. Severely encrusted polyurethane ureteral stents: management and analysis of potential risk factors. Urology. 2001;58(4):526-31.

15. El-Faqih SR, Shamsuddin AB, Chakrabarti A, Atassi R, Kardar AH, Osman MK, Husain I. Polyurethane internal ureteral stents in treatment of stone patients: morbidity related to indwelling times. The Journal of urology. 1991;146(6):1487-91.

16. Bultitude MF, Tiptaft RC, Glass JM, Dasgupta P. Management of encrusted ureteral stents impacted in upper tract. Urology. 2003;62(4):622-6.

17. Kawahara T, Ito H, Terao H, Yamagishi T, Ogawa T, Uemura H, Kubota Y, Matsuzaki J. Ureteral stent retrieval using the crochet hook technique in females. PLoS One. 2012;7(1):e29292.

18. Pogula VR, Reddy S, Galeti EH, Rasool M. Stenting versus non-stenting before extracorporeal shock wave lithotripsy for proximal ureteric stones: A prospective interventional study. Asian Journal of Medical Sciences. 2022;13(3):118-24.

19. Segalen T, Lebdai S, Panayotopoulos P, Culty T, Brassart E, Riou J, Azzouzi AR, Bigot P. Double J stenting evaluation after ureteroscopy for urolithiasis. Progrès en Urologie. 2019 ;29(12):589-95.

20. Khan AA, Khan SM, Kanth AN, Khan AM, Wani OA. Comparison of stented versus non-stented patients of ureteric calculi after intracorporeal lithotripsy. International Surgery Journal. 2022 Jan 29;9(2):426-31.

21. Matani YS, Al-Ghazo MA, Al-Azab RS, Bani-Hani O, Rabadi DK. Emergency double-J stent insertion following uncomplicated Ureteroscopy: risk-factor analysis and recommendations. International braz j urol. 2013;39(2):203-8.

22. Srivastava A, Gupta R, Kumar A, Kapoor R, Mandhani A. Routine stenting after ureteroscopy for distal ureteral calculi is unnecessary: results of a randomized controlled trial. J Endourol. 2003; 1710:871-4.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.85526

Original Article

Catastrophic Health Expenditure and Disease Burden among Rural Households in Bangladesh: A Cross-Sectional Study from Mirsharai, Chittagong

Islam MZ[1], Rahman MH[2], Rahman ME[3], Rana MJ[4], Ahmed T[5], Ahsan NS[6], Hoque M[7], Fatema UK[8], SA Shiblee[9], Hossain MK[10], Ahmed MA[11]

Abstract

Households in rural Bangladesh face severe financial hardship due to rising healthcare costs, particularly for chronic and non-communicable diseases. This study examined the patterns of illness, treatment practices, and catastrophic health expenditure among residents of Masjidia village, Mirsharai, Chittagong. A community-based cross-sectional survey was conducted in 2016 among 152 households to retrospectively assess healthcare utilization and expenditure patterns for 2015-2016. Convenience sampling was used due to geographical constraints. Catastrophic health expenditure was defined as spending exceeding 10% of total household income. Data were collected using structured questionnaires and analyzed descriptively. Illness prevalence was 84.2% among respondents. The average annual household income was BDT 35,352, while total healthcare expenditure accounted for 52.5% of this income, exceeding the catastrophic threshold by fivefold. Medication costs were the major expense, comprising 49–82% of total healthcare spending, followed by consultation, investigation, and transport costs. Most treatments were sought from private clinics and specialists, indicating high out-of-pocket dependency. The reliance on allopathic medicine remained dominant (above 94%), reflecting both accessibility and perceived efficacy. Health spending in rural Bangladesh imposes a catastrophic financial burden on households, driven primarily by medication costs and private-sector dependence. Targeted interventions—including subsidized essential medicines, expansion of community-based insurance, and improved public primary healthcare—are essential to reduce financial vulnerability and promote equitable access.

Keywords: *Rural health, health expenditure, catastrophic spending, non-communicable diseases, Bangladesh, socioeconomic burden, health financing, out-of-pocket costs.*

1 Dr. Md. Zahirul Islam, Resident, MD (Cardiology), National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh.
2 *Md. Habibur Rahman, Senior Research Assistant, IPDI Foundation. Dhaka, Bangladesh. E-mail: habib.ipdi21@gmail.com
3 Dr. Md. Ebnul Rahman, Resident MD (Radiation Oncology), NICRH, Dhaka, Bangladesh.
4 Dr. Md. Jewel Rana, Resident, MD (Cardiology), National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh.
5 Dr. Tanvir Ahmed, Resident, MD (Cardiology), National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh.
6 Dr. Nafiz Saadman Ahsan, Resident, MD (Cardiology), National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh.
7 Dr. Mezbah Ul Hoque, Resident, MS (Neurosurgery), BSMMU, Dhaka, Bangladesh.
8 Dr. Umme Kanij Fatema, Clinical Research Assistant, Hamilton General Hospital, Hamilton, ON, Canada.
9 Dr. SA Shiblee, Director, IPDI Foundation, Dhaka, Bangladesh.
10 Mir Khalid Hossain M.Sc. student, Department of Statistics and Data science, Jahangirnagar University, Dhaka, Bangladesh.
11 Dr. Mohsin Ahmed, Professor & Head of the Department, Cardiology, Kurmitola General Hospital, Dhaka, Bangladesh.
*For correcpondence

INTRODUCTION

Healthcare expenditure has emerged as a major public health and socioeconomic challenge in low- and middle-income countries (LMICs) such as Bangladesh. Although the nation has made substantial progress in improving health indicators through expanding service delivery and disease control initiatives, the burden of out-of-pocket (OOP) expenditure remains disproportionately high. The World Health Organization (WHO) defines catastrophic health expenditure (CHE) as healthcare spending that exceeds a specific proportion of household income or total consumption, leading to impoverishment and financial distress among affected families[1].

In Bangladesh, more than 67% of healthcare expenditure is paid directly out-of-pocket, one of the highest rates in South Asia[2]. Limited coverage of health insurance and

inadequate public-sector health financing drive households to rely heavily on private providers and pharmacies[3]. For low-income rural communities, even minor illness can impose substantial financial hardship, often forcing households to borrow money, sell assets, or forego essential consumption.

Several studies have highlighted that catastrophic expenditure disproportionately affects rural and economically vulnerable populations, especially those suffering from chronic and non-communicable diseases (NCDs) such as cardiovascular disease, diabetes, and chronic respiratory disorders[4–6]. In the absence of financial protection mechanisms, such households frequently experience a downward spiral of poverty, disease, and debt.

Mirsharai, a semi-rural upazila in Chittagong district, typifies these challenges. Local households face increasing costs for medical consultation, diagnostic services, and medicines, most of which are sourced from private facilities[7]. Despite high disease prevalence, empirical data on the extent and pattern of catastrophic health spending at the village level remain scarce.

Therefore, this study aimed to assess the burden and determinants of catastrophic health expenditure among rural households in Masjidia village, Mirsharai, Chittagong. The specific objectives were to identify the prevalence of illness, analyze patterns of healthcare-seeking behavior, and quantify the proportion of households incurring catastrophic expenditure. The findings may inform policymakers and development partners in designing equitable health financing and community-based risk protection models for rural Bangladesh.

MATERIALS AND METHODS

Study Design and Setting

This study was carried out in Masjidia village, part of Mirsharai Upazila in Chittagong District, Bangladesh. We conducted a cross-sectional study and analysed the retrospective expenditures for the year 2015 combined with the appropriate data from 2016.

Study Population and Eligibility

Both men and women living in the village were invited to take part. Those who were present during the data collection and agreed to participate were included. People who were absent, critically ill, or unable to answer questions were not included.

Sample Size and Sampling

It was necessary to conduct convenient sampling due to the limits of the geographical area. Although this method was not probabilistic, it allowed for the rapid collection of data from hard-to-reach families, similar to approaches used in other LMIC research. The study found a 15% difference in spending burden (a=0.05, P=0.80) among 152 households, which is aligned with prior LMIC surveys.

Data Collection

The data was collected by 26 medical students working in pairs, forming 13 teams. Every team received ten questionnaires comprising both open-ended and fixed-choice forms. Face-to-face interviews with participants allowed them to compile details on health together with socioeconomic background as well as demography. Teams had clipboards, blood pressure monitors, and writing tools, among other things. Closely monitoring the procedure when faculty members made sure everything went as planned.

Variables and Definitions

Researchers collected information on general factors like age, sex, religion, job, education, family type and size, and socio-economic status. Education levels ranged from illiterate to graduate and beyond. Families were categorized into different types. Nuclear families consist of parents and their children. Joint families include multiple married couples living together. Extended families are made up of a young couple, their children, and their parents.

Socioeconomic status was measured using a modified scale based on household income, type of housing, land ownership, and sanitation. Based on their scores, families were placed into lower, lower-middle, upper-middle, or upper-class categories.

Health-related information focused on costs:

Direct costs such as medicine, transport, doctor visits, tests, and special diets. Indirect expenses include missed income from illness or caregiving as well as days off from work or education. Healthcare utilization includes kind of provider (specialist, MBBS doctor, village doctor); where patients sought treatment (private clinic, hospital, community clinic); and treatment approaches (allopathic or homeopathic).

Data Quality and Analysis

Descriptive statistics: Frequencies (%) for categorical variables (disease prevalence, provider types); means (SD) for continuous variables (income, expenditures).

Expenditure-income ratios: Percentage of income spent on healthcare calculated per WHO standards.

Bias mitigation: Recall bias (2015 data): Cross-verified large purchases (> BDT 500) with prescriptions/receipts where available. Missing data: Excluded incomplete responses (n=2; 1.3% of sample). Subgroup consistency checks: Stratified analysis by socioeconomic status confirmed expenditure patterns. No inferential statistics were applied due to descriptive design and non-random sampling.

Ethical Considerations

Before the interviews, participants were told about the study's purpose, how their information would be used, and assured of confidentiality. Only those who agreed gave verbal consent. Faculty members oversaw ethical standards, following guidelines for research in community health.

RESULTS

Socio-demographic profile and economic condition of the respondents

Table I presents the socio-demographic profile of the study participants. Among 152 surveyed households, mean age ± SD of the respondents was 33.9 ± 9.1 years and majority of them (58%) were between 31–45 years of age, followed by 34% of those were in 15–30 years. The most were Muslim 140 (92.11%), male 105 (69.08%) and married 121 (79.61%). Regarding education, 56 (36.84%) were illiterate or completed primary level, 68 (44.74%) secondary, 28 (18.42%) completed higher secondary or above. Occupation-wise, job constituted the largest group 49 (32.24%), followed by small traders/ business 41 (26.97%) and farmer/ day Labourer29 (19.08%). In terms of family structure, 91 (59.87%) of respondents lived in nuclear families, 53 (34.87%) in joint families, and 8 (5.26%) in extended families. Most of the families 97 (63.82%) lived in with five or more members, followed by 43 (28.29%) with four members, 12 (7.89%) with two or three members. Regarding earning members, 95 (62.5%) of households had only one earning member, 38 (25.0%) had two, 19 (12.5%) had three.

Table-I : Socio-demographic profile of the study participants

Variable	Category	Frequency (n)	Percentage (%)
Age (in years) (Mean ± SD = 33.9 ± 9.1 years)	15–30	52	34.2
	31–45	88	57.9
	46–60	12	7.9
Gender	Male	105	69.08
	Female	47	30.92
Religion	Muslim	140	92.11
	Hinduism	12	7.89
Marital Status	Married	121	79.61
	Unmarried	21	13.82
	Widowed/ Divorced	10	6.57
Education	Illiterate and Primary Level	56	36.84
	Secondary Level	68	44.74
	Higher Secondary & above	28	18.42
Family structure	Nuclear	91	59.87
	Joint	53	34.87
	Extended	8	5.26
Family Syze	2 to 3 members	12	7.89
	4 members	43	28.29
	5 or more members	97	63.82
Occupation	Small Traders/ Business	41	26.97
	Farmer/ Day Labourer	29	19.08
	Job	49	32.24
	Workers Abroad	12	7.89
	Others	21	13.82
Earning Members	1	95	62.50
	2	38	25.00
	3 and Above	19	12.50

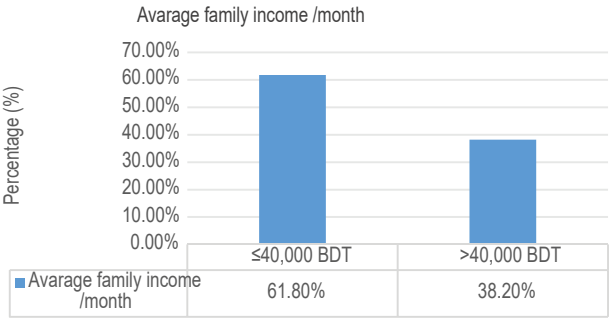


Figure- 1: Economic Status of the Respondents

Figure 1 showing the distribution of monthly family income among respondents. The majority (61.8%) reported earning ≤40,000 BDT, while 38.2% earned >40,000 BDT.

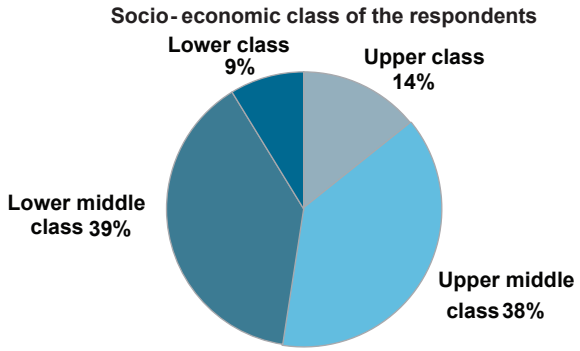


Figure 2: Socio-economic class of the respondents

Health and Disease Status of the respondents

Figure 2 displays the distribution of socio-economic class of the respondents; among respondents 39% was found lower middle class, 38% was upper middle class, 14% upper class and 9% lower class

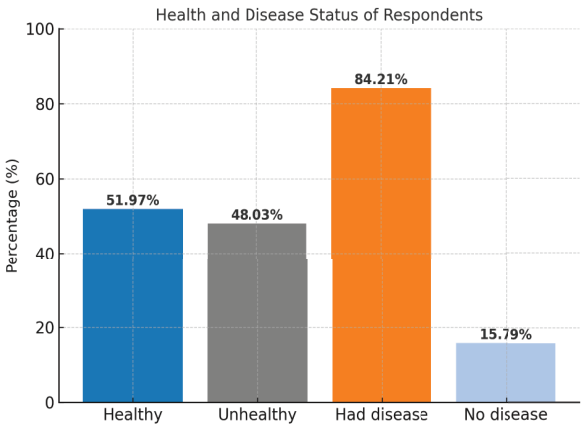


Figure 3: Health and Disease Status of Respondents

Comparative Healthcare Expenditure Patterns

Figure 3 illustrates the overall health and disease profile of the study respondents. Among the total participants, 51.97% were reported as healthy, while 48.03% were unhealthy during the study period. In contrast, when considering disease, 84.21% of respondents reported having experienced at least one disease episode during 2015, whereas 15.79% had no disease. The findings indicate that although slightly more than half of the population considered themselves healthy, a large majority had experienced illness within the reference period, reflecting a notable overlap between perceived and clinically reported health status.

Table II presents the comparative patterns of healthcare expenditure for the calendar years 2015 and 2016 in the study areas. In 2015, the total healthcare expenditure for the 152 respondents reached BDT 2,170,597, resulting in a per capita cost of BDT 14,280.24. In contrast, the total expenditure in 2016 saw a significant decline to BDT 432,668, with a per capita cost of BDT 2,846.49. Medication represented the largest portion of expenditure at 48.99% (BDT 1,063,380), followed by consultation fees at 25.28% (BDT 548,732), investigation costs at 12.82% (BDT 278,320), transport at 10.33% (BDT 224,185), and miscellaneous costs at 4.01% (BDT 86,980) in 2015. However, in comparison to 2016, medication expenses increased proportionally, accounting for 63.72% of total expenditure (BDT 275,676), while investigation costs (12.16%, BDT 52,650) and transport (12.60%, BDT 54,492) remained significant. Consultation costs (9.83%, BDT 42,550) and other costs (1.69%, BDT 7,300) experienced a relative decline.

For the larger group of 667 family members in 2015, the total healthcare expenditure was BDT 2,857,217, with a notably lower per capita cost of BDT 4,283.68. Medication expenses again dominated at 60.44% (BDT 1,727,007), followed by transport costs at 10.15% (BDT 289,945), consultation fees at 11.56% (BDT 330,430), investigations at 8.87% (BDT 253,510), and other costs at 9.04% (BDT 258,325). Similarly, for the family members in 2016, the total healthcare expenditure was recorded at BDT 1,072,054, with a per capita cost of BDT 1,607.28. Medication expenses constituted the major share at 82.05% (BDT 879,611), while shares for transport (6.24%, BDT 66,930), consultation (4.05%, BDT 43,473), investigations (4.62%, BDT 49,480), and other costs (3.04%, BDT 32,560) were significantly reduced.

Table II : Comparative Healthcare Expenditure Patterns in Masjidia, Mirsharai (2015 vs. 2016) [Values in Bangladeshi Taka]

Year 2015				
Expenditure Category	Respondents (N=152)		Family Members (N=667)	
	Yearly Expenditure (%)	Per Capita	Yearly Expenditure (%)	Per Capita
Medication	1,063,380 (48.99%)	6,995.92	1,727,007 (60.44%)	2,589.22
Transport	224,185 (10.33%)	1,474.91	289,945 (10.15%)	434.70
Consultation	548,732 (25.28%)	3,610.08	330,430 (11.56%)	495.40
Investigation	278,320 (12.82%)	1,831.05	253,510 (8.87%)	380.07
Other Costs*	86,980 (4.01%)	572.24	258,325 (9.04%)	387.29
Total amount	2,170,597 (100%)	14,280.24	2,857,217 (100%)	4,283.68
Year 2016				
Medication	275,676 (63.72%)	1,813.66	879,611 (82.05%)	1,318.76
Transport	54,492 (12.60%)	358.50	66,929.62 (6.24%)	100.34
Consultation	42,550 (9.83%)	279.93	43,473 (4.05%)	65.18
Investigation	52,650 (12.16%)	346.38	49,480 (4.62%)	74.18
Other Costs*	7,300 (1.69%)	48.03	32,560 (3.04%)	48.82
Total amaount	432,668 (100%)	2,846.49	1,072,053.62 (100%)	1,607.28

Household income is stated in Bangladeshi Taka (BDT); equivalent USD values are estimated using the 2016 exchange rate of 1 USD = 78 BDT (Bangladesh Bank, 2016).

Comprehensive Treatment Decision 2015 vs. 2016

Treatment Sites (Table III)

The selection of treatment locations among respondents and their family members exhibits significant changes from 2015 to 2016. For respondents, the proportion of treatment at private clinics experienced a slight increase from 32.00% in 2015 to 35.53% at present. Visits to Upazilla Health Complex (UHC) also saw an uptick from 15.00% to 19.74%. In contrast, the utilization of medical college hospitals plummeted from 10.00% to 3.95%. Specialized hospital visits demonstrated a modest rise from 10.63% to 13.16%, while attendance at community clinics fell from 4.25% to 2.63%. Other treatment locations represented 16.06% in 2015 and 18.10% in 2016.

For family members, private clinics emerged as the primary treatment site, increasing from 29.47% in 2015 to 46.49% currently. On the other hand, the use of UHC and medical college hospitals saw a notable decline from 24.10% and 13.68% to 9.65% and 8.77%, respectively. Other sites and community clinics maintained a relatively low yet stable level of utilization.

Treatment Providers (Table III)

With respect to healthcare providers, specialists have remained the primary caregivers for respondents, representing 38.98% in 2015 and experiencing a slight decrease to 36.7% in 2016. In contrast, MBBS doctors showed a slight uptick from 35.30% to 37.3%. The share of village doctors significantly dropped from 11.77% to 4.0%, while other providers, including pharmacists and traditional healers, increased from 13.95% to 15.3%.

Among family members, the role of specialists in treatment provision has risen, increasing from 37.87% in 2015 to 44.64% currently. The engagement of MBBS doctors has decreased from 38.46% to 33.04%. Village doctors have remained stable with a minor decline, and other providers decreased from 13.02% to 11.61%.

Treatment Patterns (Table III)

Allopathic medicine remains the leading treatment pattern among both respondents and family members throughout the years. For respondents, allopathic treatment was noted at 96.32% in 2015, which slightly declined to 94.67% in 2016. Homeopathic treatment saw a small increase from 1.23% to 2.66%,

Table- III : Comprehensive Treatment Decision in Masjidia, Mirsharai (2015 vs. 2016)

Category		Respondents		Family Members	
		2015	2016	2015	2016
Treatment Site	Private Clinic	45 (32.00)	27 (35.53)	50 (29.47)	53 (46.49)
	UHC	21 (15.00)	15 (19.74)	41 (24.10)	11 (9.65)
	Medical College Hospital	15 (10.00)	3 (3.95)	23 (13.68)	10 (8.77)
	Specialized Hospital	15 (10.63)	10 (13.16)	10 (5.79)	11 (9.65)
	Union Health Center	17 (12.06)	6 (7.89)	24 (14.21)	11 (9.65)
	Community Clinic	6 (4.25)	2 (2.63)	3 (1.58)	5 (4.39)
	Other Sites	23 (16.06)	13 (18.10)	19 (11.17)	13 (11.30)
Treatment Provider	Specialist	53 (38.98)	55 (36.7)	64 (37.87)	50 (44.64)
	MBBS Doctor	48 (35.30)	56 (37.3)	65 (38.46)	37 (33.04)
	Village Doctor	16 (11.77)	16 (4.0)	18 (10.65)	12 (10.71)
	Other Providers	19 (13.95)	23 (15.3)	22 (13.02)	13 (11.61)
Treatment Pattern	Allopathic	157 (96.32)	71 (94.67)	157 (96.32)	102 (95.33)
	Homeopathic	2 (1.23)	2 (2.66)	2 (1.23)	2 (1.87)
	Traditional/Other	4 (2.45)	2 (2.67)	4 (2.45)	3 (2.80)

Treatment Patterns and Financial Burden of Healthcare in Different Socioeconomic Classes (Table IV).

A. Treatment Utilization by Socioeconomic Class

Treatment utilization exhibited minor variations across socioeconomic classes. In the lower class (n=13), every respondent (100%) exclusively utilized allopathic treatment. The lower-middle class (n=56) also demonstrated a strong inclination towards allopathic treatment, with 98.2% selecting it, while a small fraction (1.8%) opted for Hamdard (traditional herbal medicine). In the upper-middle class (n=57), 96.5% utilized allopathic treatment, whereas 3.5% preferred homeopathic treatment. The upper class (n=24) relied solely on allopathic treatment. In summary, allopathic treatment was predominant with a utilization rate of 98.0%, followed by homeopathic (1.3%) and Hamdard (0.7%).

B. Healthcare Financial Burden

The financial burden associated with healthcare is considerable in relation to income. Respondents reported an average expenditure of BDT 14,280.24 on treatment, which represented 40.4% of their income. Additional treatments for family members incurred an extra BDT 4,283.68, which accounted for 12.1% of income. The total healthcare costs averaged BDT 18,563.92, signifying a substantial 52.5% of the average family income of BDT 35,352.32. This underscores the significant economic strain that healthcare expenses impose on families within the study area.

Table IV : Treatment Patterns by Socioeconomic Class and Financial Burden of Healthcare

A Treatment Utilization by class				
Socioeconomic Class	**Allopathic n (%)**	**Homeopathic n (%)**	**Hamdard n (%)**	**Total n**
Lower (n=13)	13 (100.0)	0 (0.0)	0 (0.0)	13
Lower-Middle (n=56)	55 (98.2)	0 (0.0)	1 (1.8)	56
Upper-Middle (n=57)	55 (96.5)	2 (3.5)	0 (0.0)	57
Upper(n=24)	24 (100.0)	0 (0.0)	0 (0.0)	24
Total	147 (98.0)	2 (1.3)	1 (0.7)	150
B. Healthcare Financial Burden				
Cost Component		**Amount (BDT)**	**% of Income**	
Respondent Treatment		14,280.24	40.4	
Family Member Treatment		4,283.68	12.1	
Total Healthcare		18,563.92	52.5	
Average Family Income		35,352.32	-	

**Treatment categories represent household-level preferences for allopathic, homeopathic, and Hamdard care during 2015-2016. Healthcare financial burden was estimated based on the ratio of annual treatment costs to reported household income. All costs are expressed in Bangladeshi Taka (BDT). Approximate conversions to USD were not included to preserve the local financial context. The average exchange rate used for 2016 is 1 USD = BDT 78, according to Bangladesh Bank (2016).

spent on treatment purpose alone!

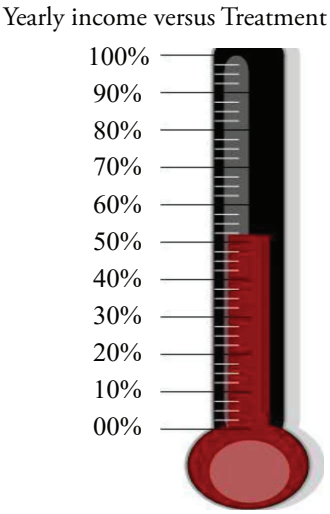


Figure-4: Yearly income versus treatment cost of a family in a thermometer chart

Figure 4 illustrates the conclusion of income versus treatment cost of a family in a thermometer chart; here displaying 52.51% of the yearly income of families of Masjidia in 2015 were

DISCUSSION

This study revealed that a very high proportion of rural households in Masjidia village experienced illness during the study period, and healthcare costs consumed an overwhelming share of household income, far exceeding the catastrophic expenditure threshold. On average, health spending accounted for 52.5% of total household income, five times higher than the WHO-recommended limit of 10% for catastrophic spending[1]. These findings confirm that illness exerts a severe economic toll on low-income households in rural Bangladesh.

The proportion of households experiencing catastrophic health expenditure in this study is consistent with findings from national and regional surveys, which estimate that between 15–25% of Bangladeshi households face CHE annually[8–10]. However, the intensity of financial burden observed here is even greater, likely reflecting the rural context and lack of access to low-cost government facilities. A WHO–World Bank report also identified Bangladesh as one of the top ten countries globally where OOP health payments push millions of households below the poverty line each year[11].

The predominance of medication costs as the largest expenditure component—constituting nearly 50–80% of total spending—is consistent with earlier studies in Bangladesh and India[12–14]. This reflects both the high price of branded drugs and the reliance on private pharmacies due to inadequate public drug supplies. Similar patterns were observed by Rahman et al.[15] and Ahmed et al.[16], who found that medicine costs alone often determine whether a household crosses the catastrophic threshold.

In terms of healthcare-seeking behavior, most respondents preferred private providers, which mirrors findings from other Bangladeshi studies showing declining confidence in public-sector services because of overcrowding, absenteeism, and perceived lower quality[17–18]. The dominance of allopathic treatment observed in this study (94%) further indicates a shift away from traditional and home-based remedies, a trend consistent with national data showing increasing biomedicalization of rural healthcare[19].

The heavy reliance on private care and self-financed drug purchases highlights the urgent need for financial protection mechanisms such as community-based health insurance, drug subsidy schemes, and expanded primary healthcare coverage. Experiences from other LMICs demonstrate that micro-insurance models, risk pooling, and voucher programs can reduce the probability of catastrophic spending[20–21]. Strengthening supply chains for essential medicines and ensuring the availability of low-cost generic drugs in rural health complexes would directly mitigate the financial burden on poor households.

CONCLUSION

Catastrophic health expenditure remains a critical challenge for rural households in Bangladesh, especially among low-income families dependent on private healthcare. With over half of household income spent on medical costs—mainly for medicines and consultations illness continues to perpetuate poverty and financial vulnerability. Strengthening financial protection through equitable health financing, affordable drug supply, and expansion of community or national insurance schemes is vital. Reinforcing primary healthcare and reducing out-of-pocket payments will be essential steps toward achieving universal health coverage and safeguarding rural populations from the economic consequences of illness.

LIMITATIONS

The study's cross-sectional design and limited sample size (n = 152) may restrict generalizability. Income and expenditure data were self-reported, introducing possible

recall bias. Nevertheless, the internal consistency of results with other national studies supports the validity of the findings.

ACKNOWLEDGEMENTS

We are grateful to all staff professional and participants.

AUTHOR CONTRIBUTIONS

Md. Zahirul Islam and SA Shiblee supervised the study, guided its design, and contributed to manuscript preparation. Md. Habibur Rahman performed statistical analysis, interpreted findings, and assisted in drafting. Mir Khalid Hossain and Umme Kanij Fatema managed data collection, referencing, and proofreading. Md. Ebnul Akil, Md. Jewel Rana, Tanvir Ahmed, and Mezbah Ul Hoque supported fieldwork and logistics. All authors reviewed and approved the final manuscript.

FUNDING

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

DISCLOSURE

The authors declare that they have no conflicts of interest related to the research, authorship, or publishing of this article. No financial assistance, grants, or financing were obtained from any public, commercial, or nonprofit sectors that could have affected the study results.

COMPETING INTERESTS

The authors declare no competing interests.

REFERENCES

1. World Health Organization. *World Health Report 2000: Health Systems—Improving Performance.* Geneva: WHO; 2000.
2. Ministry of Health and Family Welfare (MOHFW). *Health Bulletin 2021.* Directorate General of Health Services, Government of the People's Republic of Bangladesh; 2021.
3. Rahman MM, Gilmour S, Saito E, Sultana P, Shibuya K. Health-related financial catastrophe, inequality and chronic illness in Bangladesh. *PLoS One.* 2013; 8(2):e56873.
4. Alam M, Ahmed S, Begum T, Huque R. Catastrophic health expenditure and impoverishment in rural Bangladesh: evidence from household surveys. *BMC Public Health.* 2021;21:1088.
5. van Doorslaer E, O'Donnell O, Rannan-Eliya RP, et al. Catastrophic payments for health care in Asia. *Health Econ.* 2007;16(11):1159–84.
6. Xu K, Evans DB, Kawabata K, Zeramdini R, Klavus J, Murray CJL. Household catastrophic health expenditure: a multicountry analysis. *Lancet.* 2003; 362(9378):111–7.
7. Hamid SA, Ahsan SM, Begum A. Health care financing in Bangladesh: who benefits from public spending? *Bangladesh Dev Stud.* 2008; 31(3–4):25–70.
8. Hossain J, Begum S, Akter S. Household health expenditure and its implications for poverty: evidence from Bangladesh. *Soc Sci J.* 2019;56(4):541–55.
9. Khan JAM, Ahmed S, Evans TG. Catastrophic healthcare expenditure and poverty related to non-communicable diseases in Bangladesh. *J Glob Health.* 2017;7(1):010407.
10. World Bank. *Health Financing in Bangladesh: Challenges and Policy Responses.* Washington DC: World Bank; 2018.
11. Bangladesh Bureau of Statistics (BBS). *Household Income and Expenditure Survey 2016.* Dhaka: BBS, Statistics Division, Ministry of Planning; 2017.
12. Joarder T, George A, Alam K, Sarker M, Paul S, Zaman SB. Out-of-pocket expenditure and health system responsiveness in Bangladesh: evidence from a nationwide survey. *BMJ Open.* 2020;10(10): e041275.
13. Rahman A, Hasan M, Das Gupta R. Financial risk protection and catastrophic health expenditure in Bangladesh: analysis of HIES data. *Int J Health Plann Manage.* 2019;34(1):e110–e126.
14. Islam MR, Hossain M, Rahman M. Determinants of out-of-pocket health expenditure in rural Bangladesh. *Eur J Health Econ.* 2018;19(7):963–74.
15. Ahmed S, Ahmed MW, Chowdhury S, et al. Household expenditure on medicines and medical consultations: implications for health policy. *Bangladesh Med Res Counc Bull.* 2017; 43(3):128–35.

16. Rahman MS, Akter S, Rahman MM. Drug expenditure and affordability in low-income households: evidence from Bangladesh. *Int Health.* 2018;10(3):185–92.

17. Rashid SF, Akram O, Standing H. The politics of health services in rural Bangladesh: public and private sector interactions. *Health Policy Plan.* 2011;26(Suppl 1):i93–i102.

18. Bhuiya A, Hanifi SM, Roy N, Streatfield PK. Performance of the national health system in Bangladesh: progress, challenges, and future directions. *Health Syst Reform.* 2019;5(3):224–35.

19. Nahar N, Rahman M, Alam N. Transition in healthcare-seeking behavior: evidence from rural Bangladesh. *J Health Popul Nutr.* 2016;35(1):12.

20. Ekman B. Community-based health insurance in low-income countries: a systematic review of the evidence. *Health Policy Plan.* 2004;19(5):249–70.

21. Dror DM, Jacquier C. Micro-insurance: extending health insurance to the excluded. *Int Soc Secur Rev.* 1999;52(1):71–97.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.85525

Original Article

Intravenous Iron Sucrose Therapy for Iron Deficiency Anaemia in Pregnancy: Efficacy and Safety in Bangladeshi Women

*Akter T[1], Biswas J[2], Zannat MW[3], Ojha R[4], Afroz MS[5], Akhanda R[6], Khan MA[7], Elias KM[8], Hossain ML[9], Talukder KC[10]

Abstract

Background: Iron deficiency anaemia (IDA) remains a major public health concern among pregnant women in Bangladesh. Given the high prevalence of iron deficiency anaemia in pregnancy among Bangladeshi women injectable iron sucrose therapy during antenatal period may be effective in its treatment. The aim of this study was to evaluate the efficacy and safety of intravenous iron sucrose therapy in antenatal patients with IDA. Methods: A cross-sectional study was conducted among 150 pregnant women with mild to moderate IDA (Hb 7–9.9 g/dL, serum ferritin <12 µg/L) at Shaheed Suhrawardy Medical College Hospital from November 2017 to April 2018. Patients received calculated doses of intravenous iron sucrose. All of them received intravenous injection of iron sucrose in a calculated dose according to haemoglobin level. Haemoglobin levels were reassessed after 21 days of injection. Side effects were monitored. Approval of the study was obtained from Department of Obstetrics and Gynaecology, Shaheed Suhrawardy Medical College and Hospital. Written informed consents were obtained. Privacy and confidentiality of data were strictly maintained and preserved anonymously. Results: Mean age was 26.09±5.39 years, 86% were housewife and about 9% were service holder; 58% were from lower socioeconomic condition; about 39% had secondary and higher level of education. Following three weeks of intravenous iron sucrose administration at the calculated therapeutic dose, mean haemoglobin levels rose by 2.35±0.53 g/dL, increasing from 7.52±0.43 g/dL at baseline to 10.88±0.43 g/dL post-treatment. The rise of the mean haemoglobin levels was statistically significant (p<0.001). Mild adverse effects were reported in approximately 13% of participants, including epigastric discomfort (4.7%), abdominal pain (3.3%), nausea and vomiting (2.7%), and allergic reactions (2%). No serious or major side effects were observed.

Conclusion: Intravenous iron sucrose is a safe and effective therapy for IDA during pregnancy, with minimal side effects and significant improvement in haemoglobin levels. The administered dose should be calculated based on the patient's body weight and the estimated iron deficit, as determined by haemoglobin concentration and serum ferritin levels.

Key words: *Iron deficiency anaemia, Intravenous iron Sucrose, Anaemia management, Antenatal care.*

1 *Dr. Tania Akter, Assistant Professor, Dept. of Urogynaecology, Sir Salimullah Medical College and Mitford Hospital (SSMC and MH), Dhaka. Email: taniaakhter83@yahoo.com
2 Dr. Joya Biswas, Dept. of Gynaecology, Asst. Surgeon, UHC, Dhanmondi, Dhaka.
3 Dr. Mst. Wahida Zannat, Registrar, Dept. of Gynaecology, SSMC&MH
4 Dr. Rita Ojha, Dept. of Gynaecology, Asst. Surgeon, OSD, DGHS
5 Dr. Mst. Shaila Afroz, Medical Officer, Dept. of Gynaecology, UHC, Dhamrai, Dhaka
6 Dr. Rumnaz Akhanda, Medical Officer, Dept. of Gynaecology, OSD, DGHS
7 Dr. Mohammad Arafat Khan, Junior Consultant Cardiology, UHC, Dhamrai, Dhaka
8 Dr. Kazi Mohammad Elias, Junior Consultant Medicine, Shariatpur Sadar Hospital
9 Dr. Md Liakat Hossain, Department of Midicine, Indoor Medical Officer, Dhaka Medical College Hospital, Dhaka
10 Dr. Kshitish Chandra Talukder, Junior Consultant Medicine, UHC Dhamrai, Dhaka
*For Correspondence

INTRODUCTION

Iron deficiency anaemia (IDA) affects over one-third of pregnant women globally and remains a leading cause of maternal morbidity and mortality in developing countries[1]. The World Health Organization defines anaemia in pregnancy as a haemoglobin level below 11 g/dL or a haematocrit value less than 0.332[2]. In Bangladesh, 46% of non-pregnant women and 39% of pregnant women are anaemic[3]. Anaemia contributes to nearly all maternal deaths in many regions, increasing the overall risk fivefold through complications such as postpartum haemorrhage, cardiac failure, puerperal sepsis, venous thrombosis, and pulmonary embolism[4]. The risk of mortality escalates significantly in cases of severe anaemia[5].

Contributing factors to the high prevalence of anaemia in Bangladesh include early marriage, teenage pregnancy, multiparity, short birth intervals, diets rich in phytates, inadequate iron and folic acid intake, and widespread worm infestation[6]. Globally, anaemia affects approximately two-fifths of non-pregnant women and over half of all pregnant women[7]. Maternal mortality due to anaemia remains a major public health challenge in low-resource settings. An estimated 600,000 women die annually from pregnancy and childbirth-related complications, many of which are preventable with basic interventions[8].

IDA is classified as mild (8–10 g/dL), moderate (7–8 g/dL), and severe (<7 g/dL)[9]. Oral iron therapy is the first-line treatment for mild anaemia; however, poor compliance and slow haematological response limit its effectiveness in moderate to severe cases[10]. Parenteral iron therapy, particularly intravenous iron sucrose, provides faster correction with fewer adverse reactions compared to older formulations[11]. While oral iron remains the preferred option for prophylaxis and mild anaemia, moderate to severe cases often require parenteral iron and/or blood transfusion depending on haemodynamic status, gestational age, and severity[12].

Various parenteral iron preparations are available, including intravenous and intramuscular formulations. Historically, iron dextran and iron sorbitol citrate were used, but their administration required a test dose due to the risk of severe anaphylactic reactions[13]. In contrast, iron sucrose has demonstrated a favourable safety profile in pregnancy and can be administered without a test dose[14]. Intravenous iron therapy may reduce the need for blood transfusion, which carries risks such as mismatched transfusion, infection, and anaphylaxis[15].

This study evaluates the efficacy and safety of intravenous iron sucrose in pregnant women with IDA during the antenatal period. It was conducted among patients attending the selected hospital to assess the therapeutic response and tolerability of injectable iron sucrose in the management of antenatal iron deficiency anaemia.

A cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at Shaheed Suhrawardy Medical College & Hospital, Dhaka, from November 2017 to April 2018. Pregnant women presenting with mild to moderate iron deficiency anaemia (haemoglobin 7–9.9 g/dL) were screened for eligibility. Although the calculated sample size was 384, based on standard formulae, the study was limited to 150 consecutive patients due to time and resource constraints. Pregnant women with age between 18 and 40 years, singleton pregnancy between 20 and 32 weeks of gestation, mild to moderate anaemia and willingness to provide informed consent were included for this study; whereas coexisting medical conditions (e.g. hypertension, diabetes mellitus, cardiac disease, peptic ulcer, asthma, bleeding disorders, thalassemia), history of blood transfusion within the preceding 120 days and parasitic infestation confirmed by stool examination were excluded from the study. Data were collected using a structured questionnaire. All participants were admitted and underwent baseline investigations including complete blood count, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), peripheral blood smear, serum iron, serum ferritin, total iron-binding capacity (TIBC), urine analysis to exclude urinary tract infection, and stool examination for ova or cysts.

Iron sucrose infusion protocol:

The total iron requirement was calculated using the formula:

Total Iron Deficit = [Body weight (kg) × (Target Hb – Actual Hb) × 2.4] + 500 mg (iron stores).

Each patient received intravenous iron sucrose (100 mg diluted in 100 mL of normal saline) on alternate days. The average total dose administered was approximately 1500 mg. Patients were continuously monitored during infusion, with emergency resuscitation drugs kept ready.

Statistical analysis:

Data were coded, cleaned, and entered into SPSS version 22. Qualitative variables were expressed as frequencies and percentages, while quantitative variables were presented as means, standard deviations, and ranges. Student's t-test and Chi-square test were applied as appropriate. A p-value <0.05 was considered statistically significant. Informed written consent was obtained from all participants. Data were anonymized, and confidentiality was strictly maintained throughout the study.

RESULTS

In this study population comprised 150 pregnant women diagnosed with mild to moderate iron deficiency anaemia (IDA). The socio-demographic profile includes age, occupation, monthly income/ economic condition and educational status.

Table I Distribution of socio-demographic condition of the study population; study revealed a predominance of

women in the 21–30 year age group, accounting for 64% of participants (31.3% aged 21–25 years and 32.7% aged 26–30 years). Women aged ≤20 years represented 16%, while those aged 31–35 and 36–40 years constituted 14% and 6%, respectively. This distribution reflects the reproductive age concentration typical of antenatal clinic attendees in urban tertiary settings.

Table I : Distribution of socio-demographic Condition of the study population (n=150)

Age in years	Number	Percentage (%)	Mean±SD
≤20	24	16.0	26.09±5.39
21-25	47	31.3	
26-30	49	32.7	
31-35	21	14.0	
36-40	9	6.0	
Total	150	100.0	
Occupational status	**Number**	**Percentage**	
House wife	129	86.0	
Service holder	13	8.7	
Others	8	5.3	
Total	150	100.0	
Monthly income/ Socio Economic Condition			
Lower	87	58.0	
Lower middle	34	22.7	
Middle	29	19.3	
Total	150	100.0	
Educational status			
Illiterate	11	7.3	
Sign only	4	2.7	
Primary	77	51.3	
Secondary	53	35.3	
Higher secondary	5	3.3	
Total	150	100.0	

In terms of occupation, the majority were housewives (86%), followed by service holders (8.7%) and a small proportion engaged in other forms of employment (5.3%). This occupational pattern underscores the socio-cultural norm of domestic roles among pregnant women in the study region.

Monthly household income was stratified into three categories: lower income (<10,000 BDT) was reported by 58% of participants, lower-middle income (10,000–20,000 BDT) by 22.7%, and middle income (>20,000 BDT) by 19.3%. This indicates that a significant proportion of the study population belonged to economically disadvantaged groups, which may influence nutritional status and access to healthcare.

Regarding educational attainment, primary education was the most common level completed (51.3%), followed by secondary education (35.3%). A small fraction had attained higher secondary education (3.3%), while 7.3% were illiterate. The relatively low levels of formal education among participants may contribute to limited awareness of nutritional requirements during pregnancy and poor compliance with oral iron therapy.

Overall, the socio-demographic profile highlights a vulnerable population segment predominantly young, economically constrained, and with limited formal education which may predispose them to higher rates of iron deficiency anaemia and reduced access to preventive care.

Figure 2. Mode of Delivery among Study Participants

Description:
Figure 2 depicts the mode of delivery among the treated women. Most delivered vaginally, whereas a smaller proportion required caesarean section. The distribution suggests no adverse influence of intravenous iron therapy on delivery outcomes.

Legend:
Figure 2 – Frequency of vaginal and caesarean deliveries among women receiving intravenous iron sucrose. No significant difference in mode of delivery was observed in relation to iron therapy.

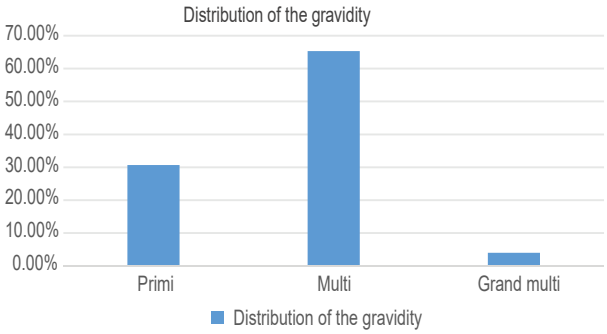


Figure- 1: Distribution of gravidity among study subjects (n=150)

Figure 1 appears the distribution of gravidity among pregnant women who received intravenous iron sucrose therapy. Multigravida women constituted the largest group (65.3%), followed by primigravida (30.7%) and grand multi (4%).

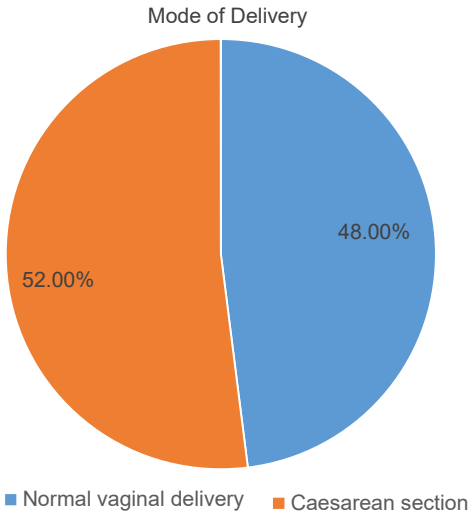


Figure- 2: Distribution of mode of delivery of the study subjects (n=150)

Figure 2 depicts the distribution of mode of delivery among the treated women. Among them, 48% were delivered vaginally and 52% needed caesarean section.

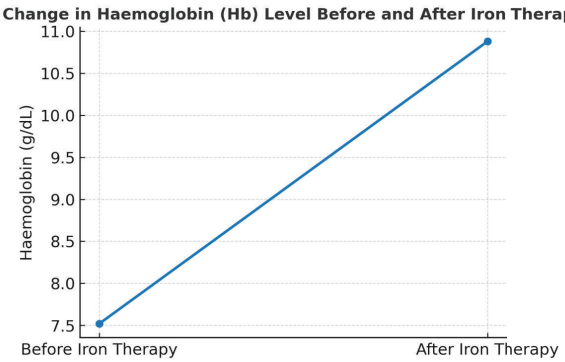


Figure- 3: Change in mean Hb levels before and after iron sucrose therapy (n=150)

Figure 3 Line Graph showing change in haemoglobin level before and after iron therapy. The line graph shows a significant improvement in haemoglobin (Hb) concentration among pregnant women receiving intravenous iron sucrose therapy. Hb increased from 7.52±0.43 g/dL before therapy to 10.88±0.43 g/dL after therapy. Mean Hb increased significantly by 2.35±0.43 g/dL after therapy ($p<0.001$), indicating marked therapeutic efficacy.

Table II summarizes the side-effects observed following intravenous iron sucrose administration. Recorded all the slide-effects were mild and transient adverse reactions, and no serious or life-threatening events occurred. Among the pregnant women 2% had allergic reaction, 2.7% had nausea/vomiting, 3.3% had abdominal pain and 4.7% had epigastric pain. No side effect was observed in most of the cases (87.3%).

Table II : Distribution of side-effects among study subjects following iron sucrose therapy

Side effect	Number	Percentage (%)	P value
Allergic reaction	3	2.0	0.001
Nausea vomiting	4	2.7	
Abdominal pain	5	3.3	
Epigastric pain	7	4.7	
No side effects	131	87.3	
Total	150	100.0	

DISCUSSION

This study evaluated the efficacy and safety of intravenous iron sucrose for management of iron deficiency anaemia (IDA) in pregnancy in a cohort of 150 antenatal women. Overall, intravenous iron sucrose produced a clinically and statistically significant rise in mean haemoglobin (Hb) from 7.52 ± 0.43 g/dL at baseline to 10.88 ± 0.43 g/dL 21 days after therapy (mean increase 2.35 ± 0.53 g/dL, $p < 0.001$). Adverse events were infrequent and mild (approximately 13% overall), with no major or life-threatening reactions recorded. Below we elaborate on each principal finding, compare with previously published data (references retained as in the submitted manuscript), and discuss clinical and public-health implications.

The observed mean Hb increase of 2.35 g/dL over three weeks indicates a rapid haematological response to parenteral iron sucrose in pregnant women with moderate IDA. This magnitude of increase is clinically meaningful: it moves many patients from the moderate into the mild/near-normal range and is likely to reduce immediate risks associated with anaemia in pregnancy (e.g., PPH, cardiac strain). This result is consistent with other institutional series reporting rises in mean Hb in the range of ~2.3–2.6 g/dL after parenteral iron sucrose therapy[3, 7, 17–20, 22]. The speed of correction observed here supports the practical advantage of IV iron when oral therapy is impractical or too slow.

Minor adverse events (epigastric pain 4.7%, abdominal pain 3.3%, nausea/vomiting 2.7%, allergic reaction 2%) occurred in ~13% of participants; no serious hypersensitivity, anaphylaxis, or infusion-related life-threatening events were documented. This favourable safety profile aligns with reports by Patel et al.[17], Van Wyck et al.10 and Al-Momen et al.[22] who found low rates of significant adverse reactions with iron sucrose. The absence of major reactions in our sample supports the established perception that iron sucrose is safer than older IV preparations (e.g., iron dextran) that required a test dose[13].

The majority of participants were young (mean 26.1 years), housewives (86%), with low or lower-middle income (58% lower, 22.7% lower-middle) and low formal education (primary level predominance). These characteristics indicate a socioeconomically vulnerable cohort in which dietary insufficiency, poor access to supplementation, early marriage and short birth spacing likely contribute to IDA, a pattern echoed by national and regional surveys and by previous work cited in this manuscript[4, 11, 15]. Socioeconomic and educational context should therefore be considered when designing antenatal iron-delivery strategies.

In our cohort caesarean section rate was 52% and normal vaginal delivery 48%; gravidity distribution showed predominance of multigravida (65.3%). We found no signal suggesting that IV iron therapy adversely affected mode of delivery. Comparisons with regional obstetric series are complex because delivery mode depends on many obstetric indications; nevertheless, our findings do not indicate increased obstetric risk related to iron sucrose therapy and are similar to results reported by others where no increase in adverse obstetric outcomes was observed following IV iron[17, 22].

Magnitude of Hb rise. The mean Hb increment in our study (2.35 g/dL) closely matches the increase reported by Thakor et al.[3] (approx. 2.3 g/dL) and Nimbalkar et al.[7]. Patel et al.[17] also documented a significant Hb rise with iron sucrose, achieving target Hb in a high proportion of patients. Al-Momen et al.[22] and Kiran et al.[20] reported comparable increases (2.3–2.5 g/dL), supporting the reproducibility of this therapeutic effect across populations and settings.

Safety profile. Earlier trials and observational studies (e.g., Van Wyck et al.[10], Patel et al.[17], Al-Momen et al.[22]) reported low rates of serious adverse events with iron sucrose and mainly mild, self-limited reactions, consistent with our data. The low frequency of allergic reactions in our sample also mirrors findings of multicentre safety studies[10,18].

Context of oral versus IV iron. Systematic reviews and comparative studies (e.g., Bhandal & Russell^6, Rohina et al.[11], Halimi et al.[22]) note that IV iron provides faster correction and higher haemoglobin increments than oral therapy, especially when oral absorption or adherence is a problem. Our rapid correction and good tolerability are therefore in line with the literature advocating IV iron in moderate-to-severe antenatal anaemia or when timely correction is required.

Population risk factors. The socio-demographic determinants (low income, limited education, multiparity) found here are concordant with national surveys and previous local studies (Rizwan et al.[11], Mahamuda et al.[15], Haniff et al.[13]), reinforcing that socioeconomic disadvantage remains a major driver of antenatal IDA in Bangladesh and similar contexts.

Intravenous iron sucrose offers a rapid and reliable means of correcting moderate iron-deficiency anaemia in pregnancy, particularly during the late second and third trimesters when swift restoration of haemoglobin and iron stores is critical. Its proven safety and efficacy suggest that antenatal units, especially in resource-limited settings, should adopt structured protocols for its use with appropriate monitoring. Early detection of anaemia, timely selection of candidates unsuitable for oral therapy, and inclusion of IV iron in local treatment formularies can reduce transfusion requirements and improve maternal outcomes.

The study provides real-world data from an antenatal population in an urban tertiary centre and evaluates both efficacy (quantitative Hb change) and safety (systematic side-effect monitoring). The treatment protocol was standardized (dose calculation, monitoring), and follow-up timing (21 days) aligns with other clinical reports, facilitating comparisons.

CONCLUSIONS

This study corroborates existing evidence that intravenous iron sucrose is an effective and safe intervention for rapid correction of antenatal iron deficiency anaemia. It produced a significant rise in haemoglobin and ferritin levels with minimal adverse effects and without compromising maternal or delivery outcomes. Routine consideration of parenteral iron may thus be justified in

antenatal women who fail to achieve adequate response to oral supplementation. However, broader multicentre data and economic evaluations would strengthen policy recommendations.

LIMITATIONS

This study was limited by its single-centre, non-randomized design and modest sample size, which may restrict generalizability. The absence of a control group and short follow-up period precluded assessment of long-term iron repletion, neonatal outcomes, or recurrence. Biochemical monitoring was incomplete in some participants, and no cost-effectiveness analysis was performed, limiting policy applicability in resource-constrained settings.

REFERENCES

1. Bangladesh Bureau of statistics (BBS). Statistical pocket book of Bangladesh. Bangladesh Bureau of statistics, Bangladesh, 2013;522.
2. Lewis SM, Bain BJ, Bates I. Basic haematological techniques. In: Lewis SM, et al. (Eds.), Dacie and Lewis Practical Haematology. Elsevier publisher, USA, 2001;19-46.
3. Bessman JD, Gilmer PR, Gardner FH. Improved classification of anemia by MCV and RDW. Am J Clin Pathol 2013; 80(3): 322-326.
4. Li CH, Lee ACW, Mak TWL, Szeto SC. Transferrin saturation for the diagnosis of iron deficiency in febrile anemic children. The Hong Kong Practitioner 2003;25: 363-366.
5. Christensen RD, Ohles RK. Anemia unique to pregnancy & the perinatal period. In: Greer JP, et al. (Eds.), Wintrob's Clinical Hematology. Lippincott Williams & Wilkins publisher, USA, 2003;1467-1473.
6. Thakor N, Bhagora S, Asari U, Kharadi A, pandor J, prajapati D. Effect of intravenous iron sucrose therapy for moderate-to-severe anemia in pregnancy: a longitudinal study. Int J Med Sci Public Health. 2015;4:11-14
7. Nimbalkar PB , Patel JN, Thakor N. Evaluation of intravenous iron sucrose therapy for management of moderate to severe anaemia in pregnancy. International Journal of Reproduction, Contraception, Obstetrics and Gynecology 2017;6(12):5272-5276.
8. Kalaivani K. Prevalence & consequences of anaemia in pregnancy. Indian J Med Res. 2009; 130:627-33.
9. Silverstein SB, Rodgers GM. Parenteral iron therapy options. Am J Hematol. 2004; 76 : 74-8
10. Charytan C, Levin N, Al-Saloum M, Hafeez T, Gagnon S, Van Wyck DB. Efficacy and safety of iron sucrose for iron deficiency in patients with dialysis-associated naemia: North American clinical trial. Am J Kidney Dis. 2001; 37 : 300-7.
11. Bhandal N, Russell R. Intravenous versus oral iron therapy for postpartum anemia. BJOG. 2006; 113:1248–52
12. Rohina AS, Vineet VM, Navin PA, Nital PH, Vrushali DV, Anil JF. Evaluation of iron sucrose and oral iron in management of iron deficiency anaemia in pregnancy. National Journal of Community Medicine 2012;3(1): 55-61.
13. Rizwan F, Qamarunisa, Habibullah, Memon A. Prevalence of anemia in pregnant women and its effects on maternal and fetal morbidity and mortality. Pak J Med Sci 2010; 26(1): 92-95
14. Kalaivani K. Prevalence & consequences of anaemia in pregnancy. Indian J Med Res 2009; 7: 627-633.
15. Haniff J, Das A, Onn LT, Sun CW, Nordin NM, Rampal S, Bahrin S, Ganeslingam M, Kularatnam KI, Zaher ZM. Anemia in pregnancy in Malaysia: a cross-sectional survey. Asia Pac J Clin Nutr. 2007;16(3):527-36.
16. Dim CC, Onah HE. The Prevalence of Anemia Among Pregnant Women at Booking in Enugu, South Eastern Nigeria. MedGenMed. 2007; 9(3): 11.22-28.
17. Mahamuda B, Tanira S, W Feroza, Perven HA, A Shamim. Effects of maternal anaemia on neonatal outcome – a study done in the specialized urban hospital set up in Bangladesh. Bangladesh Journal of Medical Science 2011;1(3):18-23.
18. Elena L Chumak et al. Anemia in pregnancy and its association with pregnancy outcomes in the Arctic Russian town of Monchegorsk. International Journal of Circumpolar Health 2010; 69:03-14.
19. Patel S, Goyal A, Shrivastava A, Verma R. Safety and efficacy of parenteral iron sucrose complex therapy in

iron deficiency anemia in antenatal and postnatal women. Int J Med Sci Public Health 2013;2:360–3.

20. Neeru S, Nair NS, Rai L. Iron sucrose versus oral iron therapy in pregnancy anemia. Indian J Community Med. 2012;37:214-8.
21. Al-Momen AK, al-Meshari A, al-Nuaim L, Saddique A, Abutalib Z, Khashogi T, et al. Intravenous iron sucrose complex in the treatment of iron deficiency anemia during pregnancy. Eur J Obstet Gynecol Reprod Biol 1996;69:121–4.
22. Kriplani A, Mahey R. Intravenous iron sucrose therapy for moderate to severe anaemia in pregnancy, Indian J Med Res. 2013;138(1):78-82.
23. Raja K, Janjua NB, Khokhar N. Intravenous iron sucrose therapy in iron deficiency anemia in pregnancy. J Pak Med Assoc 2003;28(2):40–3.
24. Halimi S, Halimi SMA, Shoaib M. Oral versus parenteral iron therapy for correction of iron deficiency anaemia in pregnancy. Gomal J Med Sci 2011;9(1):3–5.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.85529

Original Article

Emerging Antibiotic Resistance and Limited Therapeutic Options for Common Infections in Sylhet, Bangladesh

*Benzamin M[1], Chakroborty P[2], Mahmud S[3], Das K[4], Dhar P[5], Sharma N[6], Roy D[7], Ahmad R[8], Zaman TU[9], Khatoon M[10]

Abstract

Rising antimicrobial resistance (AMR) substantially undermines infection management worldwide. In Bangladesh, regional variations in resistance hinder empirical therapy. This study characterizes local AMR patterns among clinical isolates in a private tertiary level hospital in Sylhet, Bangladesh. We retrospectively reviewed culture and sensitivity records from July 2023 to February 2024 at Mount Adora Hospital. Specimens included urine, sputum, blood, and wound swabs. Identification and antibiotic sensitivity testing followed Clinical and Laboratory Standards Institute guidelines. Descriptive statistics summarized pathogen distribution and resistance rates. Of 1,360 culture-positive specimens, urine dominated (57.6%), followed by sputum (24.1%), blood (15.9%), and wound swabs (2.4%). Escherichia coli (54.5%) and Klebsiella spp. (20.4%) led urinary isolates; Staphylococcus aureus predominated blood cultures (70.8%); Streptococcus spp. (36.6%) and Klebsiella spp. (32.9%) were common in sputum; wound swabs chiefly yielded S. aureus (42.4%). High resistance in urine isolates was noted for azithromycin (80.9%), cefixime (78.3%), and nalidixic acid (79.1%); carbapenems retained >80% activity. Bloodstream isolates showed >75% resistance to cefixime and ceftazidime but remained >80% sensitive to imipenem and amikacin. Sputum and wound pathogens exhibited similar resistance trends to first-line agents, with tigecycline and carbapenems preserving efficacy. Common antibiotics demonstrate alarming resistance rates, whereas reserve antibiotic particularly carbapenems and tigecycline remain reliable. Updated, region-specific antibiotic guidelines and stewardship interventions are immediately needed.

Keywords: *Antimicrobial resistance; antibiotic sensitivity; carbapenems; tigecycline; Bangladesh*

1. *Dr. Md Benzamin, Registrar,Department of Paediatric Gastroenterology and Nutrition, Sylhet MAG Osmani Medical College Hospital, Email:drmd.benzamin@yahoo.com;
2. Dr. Pranto Chakroborty, Research Associate, Dr. Benzamin's Pediatric Liver Research Centreand Nutrition Clinic, Sylhet.
3. Dr. Shawmik Mahmud, Medical Officer, Department of Intensive Care Unit, Mount Adora Hospital, Akhalia, Sylhet.
4. Dr. Kamalesh Das, Medical Officer, Department of Coronary Care Unit, Mount Adora Hospital, Akhalia, Sylhet,
5. Dr. Prima Dhar, Medical Officer, Department of Coronary Care Unit, Mount Adora Hospital, Akhalia, Sylhet.
6. Dr. Nilanjana Sharma, Medical Officer, Department of Coronary Care Unit, Mount Adora Hospital, Akhalia, Sylhet.
7. Dr. Debajani Roy, Medical Officer, Department of Coronary Care Unit, Mount Adora Hospital, Akhalia, Sylhet,
8. Dr. Rayhan Ahmad, Registrar, Department of Coronary Care Unit, Department of Critical Care Unit, Mount Adora Hospital, Akhalia.
9. Dr. Tanvir Uz Zaman, Deputy Director, Mount Adora Hospital, Akhalia, Sylhet
10. Dr. Mohsina Khatoon, Professor, Department of Microbiology, Sylhet Women's Medical College, Sylhet.

*For correspondence

INTRODUCTION

Antimicrobial agents including antibiotics, antivirals, antifungals, and antiparasitic are critical for treating infections. However, the rise of antimicrobial resistance (AMR) threatens these treatments. Resistance occurs when microorganisms acquire and pass on survival traits through genetic elements like plasmids[1]. The overuse and misuse of antibiotics in different sectors are fueling an AMR crisis, described as a 'silent pandemic'[2]. In 2019, antibiotic-resistant infections led to an estimated 5 million deaths, with projections indicating a sharp increase by 2050[3].

Recognizing this threat, the WHO introduced the Global Antimicrobial Resistance Surveillance System (GLASS) in 2015, aiming for standardized data collection[4]. Bangladesh followed suit in 2016 by establishing a national AMR surveillance program, collaborating with WHO and the US CDC[5]. Despite these efforts, regional differences in resistance patterns persist, highlighting the need for local

data to guide treatment[6]. Numerous studies in Bangladesh have shown that resistance to first-line antibiotics is common across various diseases, with even reserve drugs often showing resistance. This variation in resistance is region-specific[6]. Data from northeast Bangladesh, especially Sylhet, remain scarce, limiting the ability to tailor empirical therapy. This study analyses recent culture and sensitivity results from a tertiary care private hospital in Sylhet to delineate local AMR profiles and inform evidence-based antibiotic stewardship.

MATERIALS AND METHODS

Study design and setting

A retrospective record review was performed at Mount Adora Hospital, Sylhet, Bangladesh, covering July 2023 to February 2024.

Specimen selection and processing

All culture-positive reports for urine, sputum, blood, and wound swabs were included (n = 1,360). Specimens lacking demographic or susceptibility data were excluded. During the procedure, specimens were collected and transported in strict adherence to standard guidelines and processed aseptically:

- Urine: automated culture; significant growth subcultured on blood agar, MacConkey, chromogenic media.
- Blood: aerobic vials in an automated system; subculture on blood, chocolate, MacConkey, chromogenic media.
- Sputum & wound: Gram stain screening; positive samples cultured on the above media.

Identification and susceptibility testing

Isolates were identified by standard biochemical methods. Antibiotic susceptibility was determined by disk diffusion (CLSI 2023). Multidrug resistance definitions followed ECDC criteria.

The inclusion criteria for pathogens were defined as follows-

Organism growth was observed with a significant colony count; additionally, samples containing more than three types of pathogenic bacteria were identified and classified as contaminants. Patients' demographic data were also retrieved from the hospital record form. Patient demographic characteristics, culture-positive pathogens, and antibiotic susceptibility profiles were included as key variables.

Data analysis: Demographics, organism distribution, and resistance frequencies were analyzed in SPSS 27. Descriptive statistics (n, %) are displayed.

RESULTS

Patient's demographics characteristics

A total of 1,360 culture-positive samples from record were analyzed between July 2023 and February 2024. Reviewed data showed 48% (653) were in age group 19-60 years followed by 43.4% (590) and 8.6% (117) were in >60 years and 0-18 years respectively. Regarding gender distribution, 56.8% (n=772) were female and 43.2% (n=588) were male, yielding a male-to-female ratio of 1:1.31. The mean age of the population was 54.03±21.68 years. cohort's mean age was 54.0 ± 21.7 years; 56.8% were female and male-to-female ratio was 1:1.31.

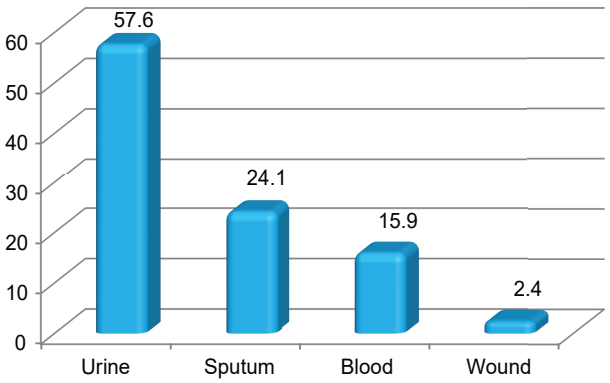


Figure-1: Distribution of culture-positive specimens (n=1,360)

Figure 1 presents the distribution of culture-positive specimen types. A total of 1,360 culture-positive specimens were analyzed across four specimen types. Among these, urine constituted the majority 783 (57.6%), followed by sputum 328 (24.1%), blood 216 (15.9%), and wound swabs 33 2.4%).

Figure 2 Distribution of organisms isolated from urine, blood, sputum, and wound swab samples. Here, Escherichia coli was the predominant isolate in urine samples (54.5%), whereas Staphylococcus aureus dominated blood cultures (70.8%) and wound swabs (42.4%). Streptococcus spp. (36.6%) and Klebsiella spp. (32.9%) were the leading isolates in sputum cultures. Pseudomonas spp. appeared frequently across all sample types, particularly in sputum (14.0%) and wound swabs (18.2%). Fungal isolates were limited (1.9%), and Enterococcus spp. and Acinetobacter spp. were rarely identified. This distribution highlights Escherichia coli as the primary urinary pathogen, Staphylococcus aureus as the major bloodstream and wound organism, and Streptococcus spp. as the predominant respiratory isolate in this study cohort.

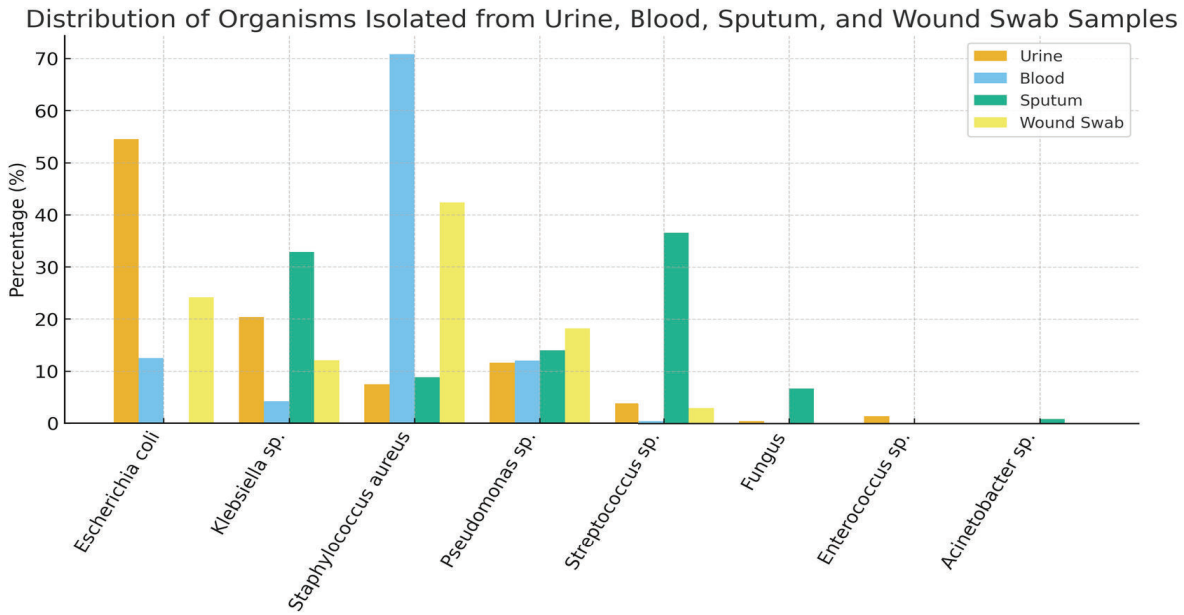


Figure- 2: Bar diagram showing distribution of organisms isolated from urine, blood, sputum, and wound swab samples (n = 1,360).

Figure 3 illustrates the antibiotic susceptibility pattern of bacterial isolates from urine cultures, here urinary isolates exhibited extensive resistance to most first-line antibiotics. Resistance was highest against azithromycin (80.9%), cefixime (78.3%), and nalidixic acid (79.1%), while moderate resistance was observed for amoxicillin (65.1%) and cefaclor (73.7%). Carbapenems demonstrated the greatest efficacy, with imipenem (83.8%) and meropenem (79.6%) showing high sensitivity rates. Among aminoglycosides, amikacin (61.2%) retained moderate activity, whereas gentamicin (49.0%) was less effective. Tigecycline (89.4%) and colistin (84.7%) exhibited the strongest overall activity against urinary isolates, while nitrofurantoin (52.3%) and doxycycline (55.7%) provided reasonable oral coverage.

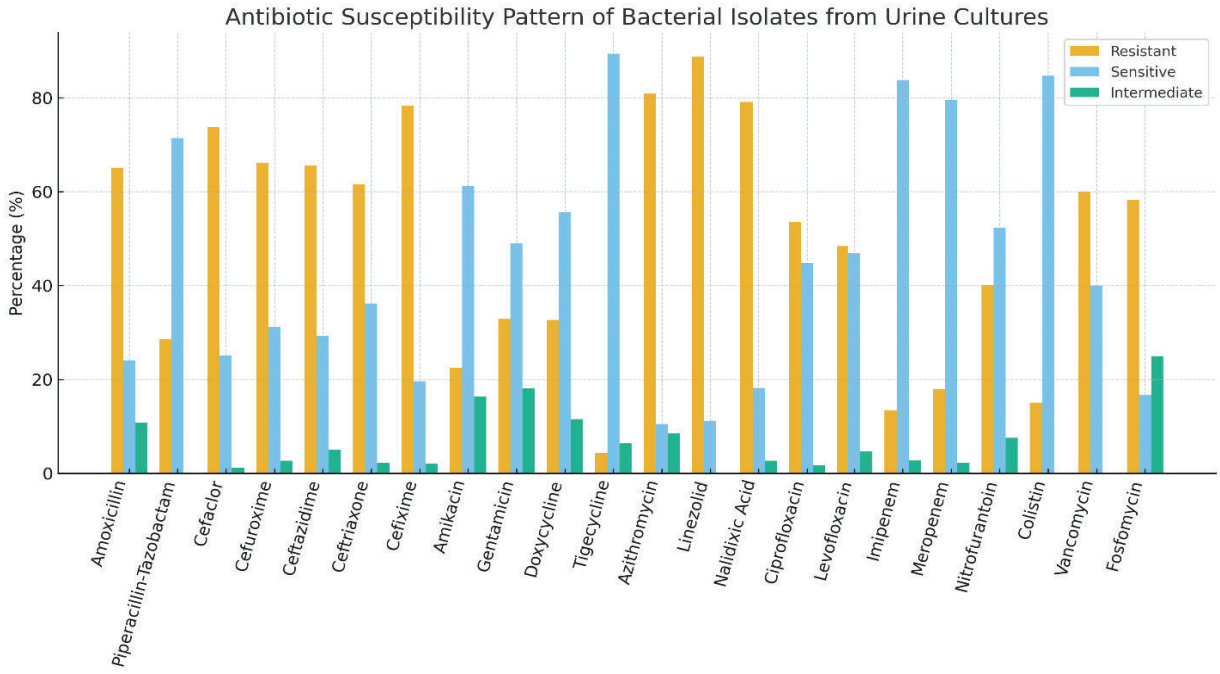


Figure- 3: Antibiotic susceptibility pattern of bacterial isolates from urine cultures (n= 783)

Table I describes the antibiotic susceptibility pattern of bacterial isolates from blood cultures, here bloodstream isolates showed moderate to high resistance to beta-lactam antibiotics. Resistance was particularly high to cefixime (82.5%), ceftazidime (77.8%), and azithromycin (75.9%), while amoxicillin displayed resistance in 36.8% of cases. Aminoglycosides retained substantial efficacy, with amikacin (82.5%) and gentamicin (68.4%) showing high sensitivity. Tetracyclines demonstrated favorable activity (doxycycline 88.7% sensitive), and tigecycline maintained good performance (85.7% sensitive). Among carbapenems, imipenem (86.8%) remained the most effective, followed by meropenem (72.9%). Vancomycin (76.3%) and colistin (67.5%) were effective against most resistant isolates.

Table- I: Antibiotic susceptibility pattern of bacterial isolates from blood cultures (n = 216)

Antibiotic Group	**Antibiotic**	**Rst. n (%)**	**Snt. n (%)**	**Imd. n (%)**
Penicillin	Amoxicillin	79 (36.8%)	127 (59.0%)	9 (4.2%)
	Piperacillin-Tazobactam	62 (28.9%)	142 (65.9%)	11 (5.2%)
Cephalosporin	Cefaclor	87 (40.1%)	115 (53.3%)	14 (6.6%)
	Cefuroxime	72 (33.2%)	141 (65.4%)	3 (1.5%)
	Ceftazidime	168 (77.8%)	44 (20.3%)	4 (1.9%)
	Ceftriaxone	91 (42.0%)	107 (49.5%)	18 (8.5%)
	Cefixime	178 (82.5%)	31 (14.2%)	7 (3.3%)
Aminoglycoside	Amikacin	24 (11.3%)	178 (82.5%)	13 (6.1%)
	Gentamicin	61 (28.3%)	148 (68.4%)	7 (3.3%)
Tetracycline	Doxycycline	19 (9.0%)	192 (88.7%)	5 (2.4%)
	Tigecycline	0 (0.0%)	185 (85.7%)	31 (14.3%)
Macrolide	Azithromycin	164 (75.9%)	41 (18.9%)	11 (5.2%)
Oxazolidinone	Linezolid	61 (28.3%)	154 (71.1%)	1 (0.6%)
Fluoroquinolone	Ciprofloxacin	70 (32.5%)	137 (63.2%)	9 (4.2%)
	Levofloxacin	54 (25.0%)	150 (69.3%)	12 (5.7%)
Carbapenem	Imipenem	22 (10.4%)	187 (86.8%)	6 (2.8%)
	Meropenem	48 (22.4%)	157 (72.9%)	10 (4.8%)
Polymyxin	Colistin	68 (31.6%)	146 (67.5%)	2 (0.9%)
Others	Vancomycin	47 (21.8%)	165 (76.3%)	4 (1.9%)
	Fosfomycin	154 (71.4%)	62 (28.6%)	0 (0.0%)

(Snt. = Sensitive, Rst. = Resistant, Imd. = Intermediate)

Table II states the antibiotic susceptibility pattern of bacterial isolates from sputum cultures; respiratory isolates displayed high levels of resistance to several antibiotic classes. Cefixime (81.2%), azithromycin (80.5%), and linezolid (78.4%) showed poor activity, whereas amoxicillin (51.0%) and ceftazidime (63.9%) were moderately resistant. Piperacillin-tazobactam (68.5%) retained satisfactory sensitivity, and amikacin (65.6%) was the most effective among aminoglycosides. Tigecycline (76.5%), imipenem (88.3%), and meropenem (84.4%) remained highly effective, confirming the sustained potency of carbapenems. Levofloxacin (64.0%) performed better than ciprofloxacin (55.8%) among fluoroquinolones.

Table- II : Antibiotic susceptibility pattern of bacterial isolates from sputum cultures (n = 328)

Antibiotic Group	Antibiotic	Rst. n (%)	Snt. n (%)	Imd. n (%)
Penicillin	Amoxicillin	167 (51.0%)	135 (41.2%)	26 (7.8%)
	Piperacillin-Tazobactam	84 (25.6%)	225 (68.5%)	19 (5.8%)
Cephalosporin	Cefaclor	201 (61.4%)	115 (35.1%)	12 (3.6%)
	Cefuroxime	167 (50.9%)	152 (46.4%)	9 (2.7%)
	Ceftazidime	210 (63.9%)	98 (29.9%)	20 (6.2%)
	Ceftriaxone	162 (49.5%)	152 (46.3%)	14 (4.2%)
	Cefixime	266 (81.2%)	58 (17.8%)	3 (1.0%)
Aminoglycoside	Amikacin	72 (21.8%)	215 (65.6%)	42 (12.7%)
	Gentamicin	97 (29.5%)	181 (55.2%)	50 (15.3%)
Tetracycline	Doxycycline	97 (29.5%)	202 (61.7%)	29 (8.8%)
	Tigecycline	19 (5.9%)	251 (76.5%)	58 (17.6%)
Macrolide	Azithromycin	264 (80.5%)	36 (11.0%)	28 (8.4%)
Oxazolidinone	Linezolid	257 (78.4%)	70 (21.2%)	1 (0.4%)
Fluoroquinolone	Ciprofloxacin	131 (39.9%)	183 (55.8%)	14 (4.2%)
	Levofloxacin	94 (28.6%)	210 (64.0%)	25 (7.5%)
Carbapenem	Imipenem	30 (9.1%)	290 (88.3%)	9 (2.6%)
	Meropenem	46 (14.0%)	277 (84.4%)	5 (1.6%)
Polymyxin	Colistin	103 (31.5%)	223 (67.9%)	2 (0.6%)
Others	Vancomycin	238 (72.5%)	88 (26.8%)	2 (0.7%)
	Fosfomycin	328 (100.0%)	0 (0.0%)	0 (0.0%)

(Snt. = Sensitive, Rst. = Resistant, Imd. = Intermediate)

Table III presents Antibiotic Susceptibility Pattern of Bacterial Isolates from Wound Swabs Wound isolates showed widespread resistance across multiple antibiotic classes. Resistance was highest to cefixime (97.0%), azithromycin (90.9%), and ceftazidime (84.8%), while amoxicillin (75.8%) also showed poor efficacy. Aminoglycosides and tetracyclines retained moderate activity, with amikacin (54.5%), gentamicin (51.5%), and doxycycline (57.6%) showing comparable sensitivity. Imipenem (63.6%) and meropenem (57.6%) demonstrated better performance among carbapenems. Notably, tigecycline exhibited 100% sensitivity, highlighting its role as the most effective agent against wound pathogens.

Table- III : Antibiotic susceptibility pattern of bacterial isolates from wound swabs (n = 33)

Antibiotic Group	**Antibiotic**	**Rst. n (%)**	**Snt. n (%)**	**Imd. n (%)**
Penicillin	Amoxicillin	25 (75.8%)	6 (18.2%)	2 (6.1%)
	Piperacillin-Tazobactam	18 (54.6%)	10 (30.3%)	5 (15.2%)
Cephalosporin	Cefaclor	27 (81.8%)	6 (18.2%)	0 (0.0%)
	Cefuroxime	24 (72.7%)	9 (27.3%)	0 (0.0%)
	Ceftazidime	28 (84.8%)	2 (6.1%)	3 (9.1%)
	Ceftriaxone	23 (69.7%)	8 (24.2%)	2 (6.1%)
	Cefixime	32 (97.0%)	0 (0.0%)	1 (3.0%)
Aminoglycoside	Amikacin	11 (33.3%)	18 (54.5%)	4 (12.1%)
	Gentamicin	12 (36.4%)	17 (51.5%)	4 (12.1%)
Tetracycline	Doxycycline	11 (33.3%)	19 (57.6%)	3 (9.1%)
	Tigecycline	0 (0.0%)	33 (100.0%)	0 (0.0%)
Macrolide	Azithromycin	30 (90.9%)	0 (0.0%)	3 (9.1%)
Oxazolidinone	Linezolid	23 (69.0%)	9 (27.6%)	1 (3.4%)
Fluoroquinolone	Ciprofloxacin	26 (78.8%)	7 (21.2%)	0 (0.0%)
	Levofloxacin	23 (69.7%)	8 (24.2%)	2 (6.1%)
Carbapenem	Imipenem	10 (30.3%)	21 (63.6%)	2 (6.1%)
	Meropenem	14 (42.4%)	19 (57.6%)	0 (0.0%)
Polymyxin	Colistin	15 (45.5%)	18 (54.5%)	0 (0.0%)
Others	Vancomycin	19 (57.6%)	14 (42.4%)	0 (0.0%)
	Fosfomycin	33 (100.0%)	0 (0.0%)	0 (0.0%)

(Snt. = Sensitive, Rst. = Resistant, Imd. = Intermediate)

DISCUSSION

This study highlights the alarming prevalence of antimicrobial resistance (AMR) among clinical isolates in Sylhet, Bangladesh. The predominance of *Escherichia coli* in urine samples (54.5%) aligns with national trends, where *E. coli* consistently emerges as the leading uropathogen[1–4]. The high resistance observed against azithromycin (80.9%), cefixime (78.3%), and nalidixic acid (79.1%) is consistent with previous reports from Dhaka and northern Bangladesh, which documented similar resistance profiles among Gram-negative urinary pathogens[5–7]. These findings reinforce the limited efficacy of first-line oral agents and underscore the need for carbapenem-based regimens, given the retained sensitivity to imipenem (83.8%) and meropenem (79.6%)[6–8].

In bloodstream infections, *Staphylococcus aureus* was the dominant isolate (70.8%), a pattern corroborated by studies from tertiary hospitals in Bangladesh[9–11]. The elevated resistance to cefixime (82.5%) and ceftazidime (77.8%) mirrors findings from Nakib et al. and Talha et al., who reported similar resistance among septicemia isolates[10, 11]. Notably, amikacin (82.5%) and imipenem (86.8%) demonstrated robust activity, supporting their role in empirical therapy for suspected bacteremia[12].

Sputum cultures revealed *Streptococcus* spp. (36.6%) and *Klebsiella* spp. (32.9%) as the most frequent pathogens. These results are consistent with Morgan et al., who identified *Streptococcus oralis* and *S. aureus* as common respiratory isolates in TB patients[13]. Resistance to azithromycin (80.5%) and linezolid (78.4%) was notably

high, echoing findings from Sorwer et al. and Islam et al., who reported diminished efficacy of macrolides and oxazolidinones in respiratory infections[14,15]. Carbapenems retained superior sensitivity, with imipenem (88.3%) and meropenem (84.4%) outperforming other agents.

Wound swabs, though fewer in number, revealed *S. aureus* (42.4%) and *Pseudomonas* spp. (18.2%) as key pathogens. These findings are supported by Nobel et al. and Munawar et al., who reported similar distributions in surgical site infections[16, 17]. The extreme resistance to cefixime (97.0%) and azithromycin (90.9%) underscores the ineffectiveness of conventional antibiotics in wound management. Tigecycline's 100% sensitivity highlights its potential as a reserve agent for multidrug-resistant wound infections.

Overall, the study confirms widespread resistance to commonly prescribed antibiotics across specimen types. The consistent efficacy of carbapenems and tigecycline across urine, blood, sputum, and wound isolates suggests their critical role in empirical therapy. However, reliance on reserve antibiotics without stewardship risks accelerating resistance even among last-line agents.

THowever, this study provides a valuable snapshot of resistance trends within a defined setting, covering multiple specimen types and a wide range of antimicrobial classes. The strength lies in its comprehensive sampling and methodical assessment of clinically relevant antibiotics.

CONCLUSIONS

This study demonstrates a high prevalence of antimicrobial resistance across all specimen types, particularly against first-line agents such as azithromycin, cefixime, and nalidixic acid. Carbapenems and tigecycline consistently showed superior sensitivity and may serve as reliable therapeutic options in multidrug-resistant infections. Specimen-specific trends—such as the efficacy of doxycycline and nitrofurantoin in urinary isolates, and aminoglycosides in wound infections—should inform empirical treatment decisions. We recommend regular updates to regional antibiotic guidelines and the implementation of robust antimicrobial stewardship strategies to mitigate resistance and preserve the efficacy of reserve antibiotics

Author contributions

a. Conception and design, or design of the research; or the acquisition, analysis, or interpretation of data: Benzamin M, Chakroborty P, Mahmud S, Das K, Dhar P, Sharma N, Roy D, Ahmed R.

b. Drafting the manuscript or revising it critically for important intellectual content: Benzamin M, Chakroborty P, Khatoon M.

c. Final approval of the version to be published: Benzamin M, Khatoon M.

d. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: Benzamin M, Khatoon M.

Acknowledgements

All the stuff of Mount Adora Hospital, Sylhet.

Funding (If funds received, otherwise none)

None

Conflict of interest

We do not have any conflicts of interest.

Ethical approval

The study involved routine clinical procedures and non-invasive data collection. Confidentiality was maintained by removing all identifying information.

Data availability statement

We confirm that the data supporting the findings of this study will be shared upon reasonable request.

REFERENCES

1. Liebert CA, Hall RM, Summers AO: Transposon Tn21, flagship of the floating genome. Microbiol Mol Biol Rev. 1999, 3:507-22. 10.1128/MMBR.63.3.507-522. 1999

2. Ahmed SK, Hussein S, Qurbani K, et al.: Fareeq A, Mahmood KA, et al.Antimicrobial resistance: impacts, challenges, and future prospects. J Med Surg Public Health. 20241, 2:100081. 10.1016/j.glmedi.2024.100081

3. O'Neill, J., S. Davies, and J Rex: "Review on antimicrobial resistance, tackling drug-resistant infections globally: final report and recommendations. [internet]." London: Wellcome Open Res.

4. World Health Organization. Global antimicrobial resistance surveillance system: manual for early implementation. Geneva: WHO. (2015136). https://iris.who.int/bitstream/handle/10665/188783/9789241549400_eng.pdf .

5. Habib ZH, Golam Rasul SB, Alam MA, et al.: The findings of antimicrobial resistance surveillance in Bangladesh (2016-2020). medRxiv [Preprint. 2021, 14:10-1101. 10.1101/2021.06.12.21251710
6. Ahmed I, Rabbi MB and Sultana S: Antibiotic resistance in Bangladesh: a systematic review. Int J Infect Dis. 20191805461, 10:1016. 10.1016/j.ijid.2018.12.017
7. Jahan F: Anwer M.2025.Nature of antimicrobial resistance of pathogens causing urinary tract infection in Bangladesh: age and gender profiles. Microbiol Spectr13:e02287-24. 10.1128/spectrum.02287-24
8. Chowdhury SS, Tahsin P, Xu Y, et al.: Trends in antimicrobial resistance of uropathogens isolated from urinary tract infections in a tertiary care hospital in Dhaka, Bangladesh. Antibiotics. 2024, 27:925-10. 10.3390/antibiotics13100925
9. Hossain MJ, Azad AK, Shahid MS, et al.: Prevalence, antibiotic resistance pattern for bacteriuria from patients with urinary tract infections. Health Sci Rep. 2024, 7:2039. 10.1002/hsr2.2039
10. Mahmood N, Siddiqui MR, Giasuddin RS, et al.: Recurrent Urinary Tract Infection-Etiology, Risk Factors and Outcome in a Tertiary Care Hospital of Bangladesh. Bangladesh J Med. 2024, 30:173-9. 10.3329/bjm.v53i3.75306
11. Shama AI, Sultana R, Ferdous M, et al.: Recent trends of antibiotic resistance patterns of Gram-negative bacteria collected from clinical isolates in Dhaka city. J Prev Diagn Treat Strateg Med. 20241, 3:122-30. 10.4103/jpdtsm.jpdtsm_39_24
12. Islam MF, Das DK, Islam B, et al.: Risk factors and antibiogram of human uropathogens in the northern part of Bangladesh: A cross-sectional study. J Appl Biol Biotechnol. 20241221224, 10:7324. 10.7324/JABB.2024.160543
13. Mazumder MM, Noman MU, Hasan AT, et al.: Bacteriological Profile and Antibiotic Sensitivity Pattern of Urinary Tract Infection. East West Med Coll J. 2025, 8:23-7. 10.3329/ewmcj.v13i1.77626
14. Ferdous M, Jabin T, Islam S, et al.: Current status of drug-resistant patterns of Gram-positive clinical isolates collected from renowned diagnostic centers of Dhaka, Bangladesh. Biomedical and Biotechnology Research Journal (BBRJ. 20241, 8:53-9. 10.4103/bbrj.bbrj_290_23
15. Talha KA, Patwary MI, Fatema K, et al.: Bacteriological Profile and Antibiogram of Blood Stream Infection in a Tertiary Teaching Hospital of Bangladesh. Mymensingh Medical Journal: MMJ. 2025, 34:186-91.
16. Nakib FF: Study on bacteriological profile and antimicrobial susceptibility pattern in septicemia suspected patients [Doctoral dissertation]. Brac University. 2024,
17. Tarana Jahan MA, Shahid SB, Khatun S, et al.: Comparison of Bacterial Etiology with Antibiogram of Blood Stream Infection between Adult and Paediatric Group at a Tertiary Care Hospital in Bangladesh. BJMS.2023 . 22: 869-875. 10.3329/bjms.v22i4.6712
18. Kalam A, Sujan MJ, Aboushady AT, et al.: Resistance Pattern of Bacterial Isolates from Clinical Specimens of Chittagong Medical College Hospital, Bangladesh: A Three-Year Retrospective Study. Preprints. 20252025030748,
19. Sorwer MS, Khan MD, Rahman MA, et al.: Antibacterial Sensitivity in Sputum among Acute Exacerbation of Chronic Obstructive Pulmonary Disease Patients. Mymensingh medical journal: MMJ. 2025, 34:691-9.
20. Morgan PA, Ntiamoah DO, Asare P, et al.: Antimicrobial Resistance Levels of Non-Tuberculous Bacteria Isolates from Sputum of TB Patients in Ghana. Infection and Drug Resistance. 2024, 31:5663-73. 10.2147/IDR.S483529
21. Islam MA, Khandaker MA, Sharma A, et al.: Patterns and Influencing Factors of Organisim and Sensitivity in Sputum at Sylhet. Saudi J Med. 2024, 9:276-86. 10.36348/sjm.2024.v09i07.009
22. Nobel FA, Ahammad H, Saha SR, et al.: Determination of multi-drug resistance profile of isolated Gram-positive and Gram-negative bacteria from clinical pus samples in Bangladesh. J Adv Biotechnol Exp Ther. 2024, 7:178. 10.5455/jabet.2024.d16
23. Munawar S, Sami A, Rafiq K, et al.: Analyzing the prevalence and patterns of antibiotic-resistant pathogens causing surgical site infections: antibiotic resistance in surgical site infections. Pakistan Journal of Health Sciences. 2024, 31:268-76. 10.54393/pjhs.v5i08.1758.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.85527

Original Article

Bone Marrow Morphology and Immunophenotypic Expression in De-Novo Acute Leukaemia

*Islam KMK[1], Jahan I[2], Masud MAH[3], Nazneen S[4], Zinan MTI[5], Tasnova T[6], Yunus ABM[7]

Abstract

Acute leukaemias are a heterogeneous group of hematologic malignancies with diverse morphologic and immunophenotypic profiles. It's characteristics differ in clinical, morphological, immunophenotypic, genetic, and molecular perspective. Despite the increasing importance of molecular and genetic features in the classification of acute leukemias, morphological and immunophenotypic analysis remains the primary method to diagnose acute leukemia for initial evaluation and to guide specific molecular genetic tests. This study was conducted to observe the immunophenotypic patterns and their morphological expression among patients with acute leukemia, and to find the correlation between the immunophenotypic markers and the different French-American-British (FAB) sub-classifications of acute leukemias. This descriptive cross-sectional study was designed to evaluate the extent and correlation of bone marrow morphological features with immunophenotypic expression in patients with de-novo acute leukaemia (AL) and to determine discrepancies between morphology and immunophenotyping. This study was conducted in the Department of Haematology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, from January 2017 to June 2018. Fifty (50) newly diagnosed de-novo AL patients were evaluated through bone marrow morphology and flow cytometric immuno- phenotyping. The Beckman Coulter Cytomics FC 500 was used to analyze surface and cytoplasmic antigens. Data were analyzed using SPSS v23 with descriptive and inferential statistics. Among 50 patients, 30 (60%) were male and 20 (40%) female. The predominant age group was 19 to 29 years (42%). Morphologically, two-third (66%) cases were acute myeloid leukaemia (AML) and one-third (34%) acute lymphoblastic leukaemia (ALL). Among AML cases, the most frequent FAB subtypes were M1 (24%), M2 (20%), and M4 (14%); among ALL cases, L2 subtype was most common (20%). Immunophenotyping identified one-third (66%) of AML, 28% B-ALL, 6% T-ALL, and 4% mixed phenotypic acute leukaemia (MPAL). Expression positivity was highest for CD45 (94%), cMPO (66%), and HLA-DR (78%). Discrepancy between morphology and immunophenotype was observed in 12% cases. Bone marrow morphology remains essential in the initial evaluation of de-novo acute leukaemia, but immunophenotyping provides critical complementary data for accurate subtyping. A 12% diagnostic discrepancy highlights the necessity for integrated morphologic-immunophenotypic assessment to ensure precise classification and guide targeted therapy.

Keywords: *De-novo acute leukaemia, bone marrow morphology, immunophenotype, flow cytometry, mixed phenotypic acute leukaemia.*

1. *Dr. Kazi Mohammad Kamrul Islam, Assistant Professor, Department of Haematology, Bangladesh Medical University (BMU), Dhaka, Bangladesh. Email: kamrul@bsmmu.edu.bd
2. Dr. Israt Jahan, Assistant Professor, Department of Neurology, Dhaka Medical College (DMC), Dhaka, Bangladesh.
3. Dr. Md. Adnan Hasan Masud, Associate Professor, Department of Haematology, BMU, Dhaka, Bangladesh.
4. Shahela Nazneen, Associate Professor, National Institute of Kidney Diseases and Urology (NIKDU), Dhaka, Bangladesh.
5. Dr. Md. Talha Islam Zinan, Medical Officer, Department of Haematology, BMU, Dhaka, Bangladesh.
6. Dr. Tania Tasnova, Medical Officer, Department of Haematology, BMU, Dhaka, Bangladesh.
7. Prof. Dr. A. B. M. Yunus, Department of Haematology, BMU, Dhaka, Bangladesh.

*For correspondence

INTRODUCTION

Acute leukaemia (AL) represents a heterogeneous group of haematological malignancies characterized by clonal proliferation of immature haematopoietic cells with rapid clinical progression[1]. The diagnosis relies primarily on bone marrow morphology and immunophenotyping, which together establish lineage and guide therapy[2].

The French–American–British (FAB) classification introduced morphologic criteria dividing acute leukaemias into seven subtypes of AML (M0–M7) and **three subtypes of ALL (L1–L3)**[3–4]. Although the FAB system remains useful for initial diagnosis, it lacks the molecular precision required for risk stratification. Patients whose

blasts co-express both myeloid and lymphoid markers are categorized as mixed phenotypic acute leukaemia (MPAL), a rare subtype accounting for 2–5% of AL[5–6].

Morphology alone may be insufficient in distinguishing subtypes such as AML-M0 from M1 or differentiating B-ALL from T-ALL. Moreover, aberrant antigen expression and minimal residual disease (MRD) detection require flow cytometric immunophenotyping, now considered an indispensable diagnostic tool[7–9].

Given the limited data from Bangladesh, particularly regarding the extent and influence of morphological–immunophenotypic correlation in de-novo AL, this study aimed to assess bone marrow morphology with immunophenotypic expression patterns and identify diagnostic discrepancies in newly diagnosed cases at a tertiary care center in Dhaka.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Haematology, BSMMU, from January 2017 to June 2018. Fifty (50) consecutive patients with de-novo acute leukaemia diagnosed on peripheral smear were enrolled. Patients aged ≥14 years, newly diagnosed with acute leukaemia and untreated prior to enrollment, were included. Relapsed or secondary leukaemias were excluded.

Bone Marrow Examination: Morphologic classification was done following FAB criteria.

Immunophenotyping: Performed using Beckman Coulter Cytomics FC 500 flow cytometer, analyzing cell surface and cytoplasmic antigens with fluorochrome-conjugated antibodies (CD3, CD5, CD7, CD10, CD13, CD19, CD22, CD33, CD45, CD79a, CD117, cMPO, HLA-DR, TdT).

Standard single-cell suspension techniques and quality controls were applied.

Data Analysis: SPSS v23 was used. Quantitative data were summarized by mean ± SD; qualitative data by frequency and percentage. Z-test was applied, with $p < 0.05$ considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the BSMMU institutional review board. Written informed consent was obtained from all participants.

RESULTS

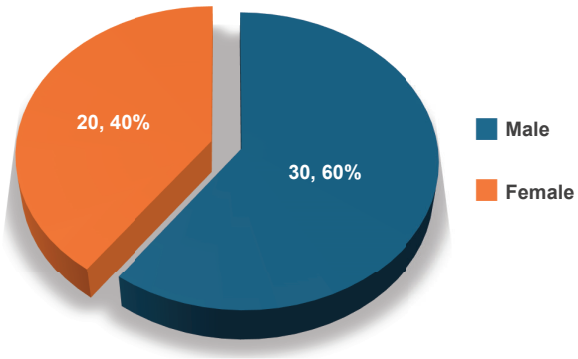
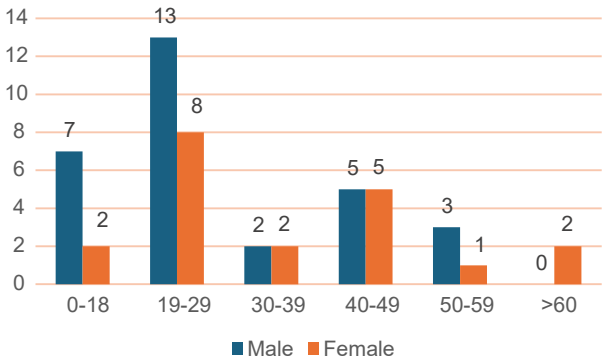


Figure- 1: Sex Distribution of the Study Subjects (n=50)

Figure 1 pie chart displays the sex distribution of the patients; a total of 50 patients were included in this study according to selection criteria. Among the patients 30 (60%) were male and 20 (40%) were female.



Figur- 2: Age Distribution of the Study Subjects (n=50)

Figure 2 presents the distribution of the patients; majority (42%) of the respondents was found in the age group of 19-29 years.

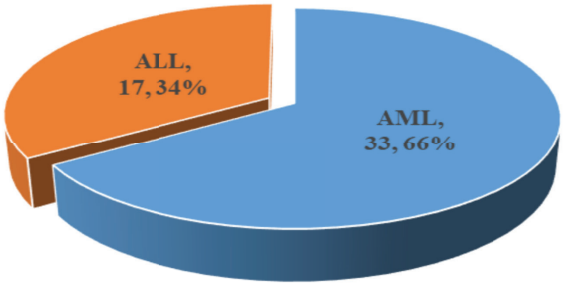
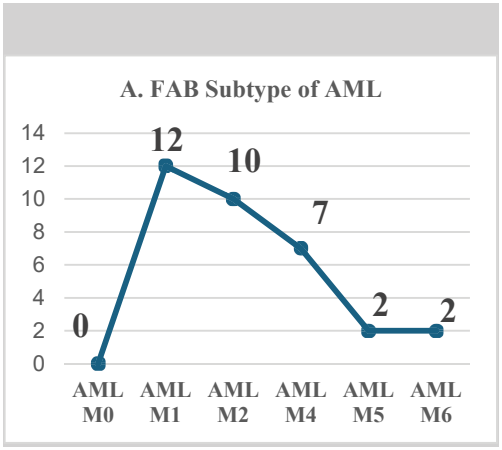


Figure- 3: Distribution of morphologic types of acute leukaemia (n=50)

Figure 3 shows the distribution of morphologic types of acute leukaemia of BM; here 33 (66%) patients were AML and 17 (34%) patients were ALL by morphologic assessment of BM.



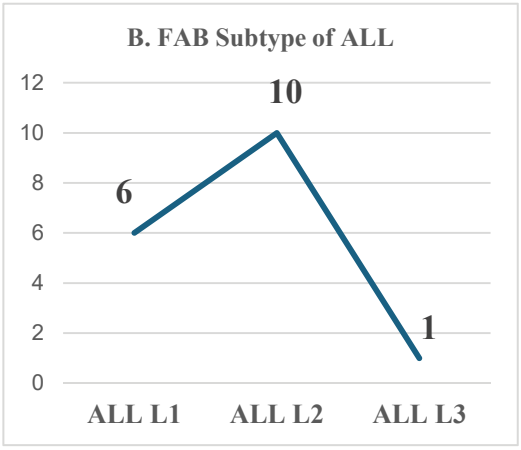


Figure- 4 (A & B): Distribution of FAB sub type (morphological) of acute leukaemia (n=50)

Figure 4 (A & B) states the distribution of FAB sub type (morphological) of acute leukaemia; here, among AML cases,figure 4A uncover M1 (24%), M2 (20%), and M4 (14%) were most frequent; figure 4B shows for ALL, L2 (20%) predominated.

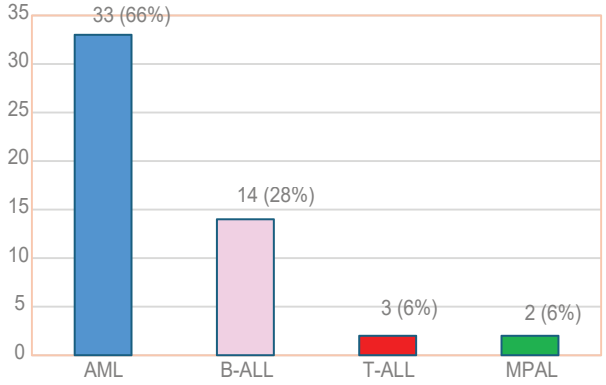


Figure- 5: Immunophenotypic distribution of acute leukaemia (n=50)

Figure 5 illustrates the Immunophenotypic distribution of acute leukaemia; here, Flow cytometry identified 33 (66%) AML, 14 (28%) B-ALL, 3 (6%) T-ALL, and 2 (4%) MPAL.

Immunophenotypic marker Positivity in FAB Sub-Classification of AL. There is positivity of CD3 in 10 (20%), CD5 in 9 (18%), CD7 in 11 (22%), CD10 in 13 (26%), CD19 in 15 (30%), CD22 in 9 (18%), CD79a in 17 (34%), CD13 in 28 (56%), CD33 in 31 (62%), CD117 in 21 (42%), cMPO in 33 (66%), CD45 in 47 (94%), HLADR in 39 (78%) and TdT in 10 (20%) were found. (Table-1).

Table 1 states the distribution of immunophenotypic marker positivity in FAB subtypes. Marker positivity was most frequent for CD45 (94%), CD33 (62%), cMPO (66%), and HLA-DR (78%)

Table- I: Distribution of immunophenotypic marker positivity in FAB subtypes (n=50)

FAB	CD3	CD5	CD7	CD10	CD19	CD22	CD79a	CD13	CD33	CD117	cMPO	CD45	HLA DR	TdT
AMLM1	2	1	3	1	0	1	3	8	11	8	11	12	7	1
AMLM2	2	1	3	0	1	2	1	8	7	6	9	10	8	0
AMLM4	2	0	1	0	1	0	0	6	7	2	7	7	7	1
AMLM5	0	0	0	0	0	0	0	2	2	0	2	2	2	0
AMLM6	1	0	1	0	0	0	0	2	2	2	2	2	2	0
ALLL1	1	0	1	5	5	1	5	1	1	1	1	4	5	3
ALLL2	2	7	2	7	7	5	7	1	1	2	1	10	7	5
ALLL3	0	0	0	0	1	0	1	0	0	0	0	0	1	0
Total	10	9	11	13	15	9	17	28	31	21	33	47	39	10
	(20%)	(18%)	(22%)	(26%)	(30%)	(18%)	(34%)	(56%)	(62%)	(42%)	(66%)	(94%)	(78%)	(20%)

Morphology–Immunophenotype Correlation

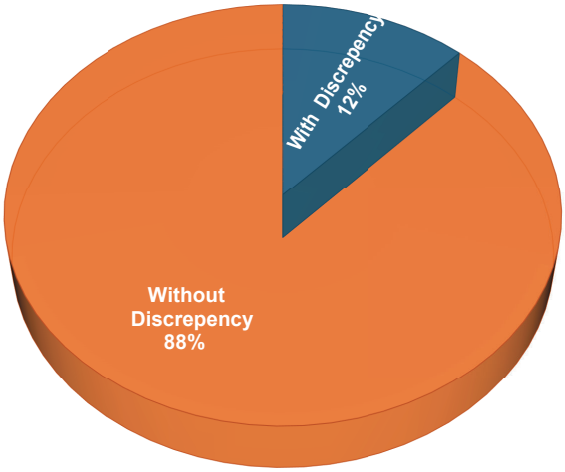


Figure- 6: Frequency of morphological–immunophenotypic discrepancy

Figure 6 unwrap the frequency of morphological–immuno- phenotypic discrepancy. A strong concordance was observed in 44 (88%) cases, whereas 6 (12%) showed diagnostic discrepancy between morphology and immuno-phenotype.

DISCUSSION

In this study, from January 2017 to June 2018, carried out in the department of Haematology, BSMMU, out of 50 patients of newly diagnosed untreated de-novo Acute Leukaemia patients from 14 to 65 years of age, there were 30 (60%) male and 20 (40%) female patients. There were 33 (66%) AML patients and 17 (34%) ALL patients. Majority (42%) of the respondents was found in the age group of 19-29 years. In this study shows on BM morphology 33 (66%) patients were AML and 17 (34%) patients were ALL. Among the ALL, there were 14 (28%) B ALL patients and 3 (6%) T ALL patients. The most frequent FAB subtype is AML M1 12 (24%), AML M2 10 (20%) and ALL L2 10 (20%) patients. It is observed that there are 2 (4%) patients of AL have got the immunophenotypic variety of MPAL. Among them morphologically 01 patient was from AML M1 and another 01 was from AML M4. In Jordan JRMS September 2015 Abbasi N, Kamal N et al. showed 48.2% of ALL and 51.8% of AML. Among the cases of ALL, 79.3% were identified as B-ALL and 20.7% as T-ALL. [10]

There were 33 (66%) AML patients, 14 (28%) B ALL patients and 3 (6%) T ALL patients. There is positivity of CD3 in 10 (20%), CD5 in 9 (18%), CD7 in 11 (22%), CD10 in 13 (26%), CD19 in 15 (30%), CD22 in 9 (18%), CD79a in 17 (34%), CD13 in 28 (56%), CD33 in 31 (62%), CD117 in 21 (42%), cMPO in 33 (66%), CD45 in 47 (94%), HLADR in 39 (78%) and TdT in 10 (20%) were found. In this Study, there was 6 (12%) cases where there was discrepancy of morphological and immunophenotypic diagnosis of AL. Similar study was done by Gupta et al. (2015) where in 73% cases of acute leukemia found similarity in morphological appearance and immunophenotyping and remaining 27% cases shows discrepancy between morphological findings and immunophenotyping expression. Diagnosis in these 27% patients changed after immunophenotyping. [11]

CONCLUSIONS

In this study, it was observed that on bone marrow morphology 66% patients were AML and 34% patients were ALL. After Immunophenotyping study, among the ALL patiewnts, there were 14 (28%) B ALL patients and 3 (6%) T ALL patients. On bone marrow morphology, the most frequent FAB subtype is AML M1 24%, AML M2 20% and ALL L2 20% patients. There are 2 (4%) patients of AL have got the immunophenotypic variety of MPAL. Among them morphologically 01 patient was from AML M1 and another 01 was from AML M4. In this Study, there was 12% cases where there was discrepancy of morphological and immunophenotypic diagnosis of AL.

LIMITATIONS

Only a few selected available immunophenotypic markers of myeloid, lymphoid and other origin were used to see the pattern of Immunophenotypes. Extensive Immuno-phenotypic panel for the diagnosis of AL could not be done. Further follow up could not be done to see the remission status and to assess the prognostic significance.

DECLARATION

This topic is partially published in Haematology Journal of Bangladesh with similar demographic data in 2022.

FINANCIAL DISCLOSURE

The authors declared that this study has received no financial support.

REFERENCES:

1. Onciu M. Acute lymphoblastic leukemia. Hematol Oncol Clin North Am 2009; 23(4):655-674.
2. Singer M, Rai AK, Saxena A, et al. Acute leukemia: Diagnosis improved by flow cytometry in addition to morphology. Asia Pac J Clin Oncol. 2009; 5:55-65.

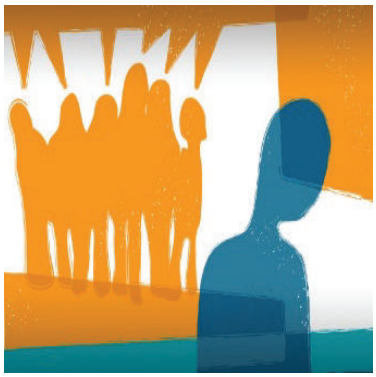
3. Bennett JM, Catovsky D, Daniel MT, et al. Proposals for the classification of the acute leukemias. French American British (FAB) Cooperative Group. Br J Haematol. 1976; 33: 451-458.
4. Bennett JM, Catovsky D, Daniel MT et al. Proposed revised criteria for the classification of acute myeloid leukemia. A report of the FAB Cooperative Group. Ann Intern Med 1985; 103: 620-625.
5. Killick S, Matutes E, Poeles RL. Outcome of biphenotypic acute leukemia. Haematologica. 1999: 88; 699-706.
6. Lee PS, Lin CN Liu C, Huang CT, Hwang WS. Acute leukemia with myeloid, B- and natural killer cell differentiation. Arch Pathol Lab Med 2003; 127(2); E93- 95.
7. Ibrahim AM, Hamid BM. Prognostic value of myeloid antigen expression in childhood acute lymphoblastic leukemia Iraqi Jr of hematol 2017; 6(1);12-16.
8. Huh Y.O, Ibrahim S. Immunophenotypes in adult acute lymphocytic leukemia. Role of flowcytometry in diagnosis and monitoring of disease. Hematol Oncol Clin North Am 2000; 14:1251-65.
9. Das A, Mohanty P, Sethy S, et al. Immunophenotyping in acute leukaemia- an institutional study. J. Evid. Based Med. Healthc. 2018; 5(7), 600-604. DOI: 10.18410/jebmh/ 2018/123
10. Abbasi N, Kamal N, AL-Kaisi N, Aljaafreh L. Immunophenotypic Profile of Acute Leukemia Cases Using Multicolor Flow Cytometry; Three Year Experience at King Hussein Medical Center. Journal of The Royal Medical Services. 2015; 22(3): 53–58.
11. Gupta A., Pal A. and Nelson S. Immunophenotyping in Acute Leukemia : A clinical study; International Journal of Scientific Study. 2015; 3(5): 129–136.

Bangladesh Med J. 2024 Sept; 53(3)
DOI: https://doi.org/10.3329/bmj.v53i3.85528

Review Article

Marginalized Population
Scopes and Opportunities for Universal Health Coverage in Bangladesh
Marginalized Population - Universal Health Coverage - SDGs

Halim KS[1], ...



Abstract

Achieving universal health coverage (UHC) is central to the health-for-all agenda and the Sustainable Development Goal (SDG) 3.8. Bangladesh has made significant progress in health outcomes, yet large segments of marginalized populations remain left behind. To review the current status of health provision and financing for marginalized populations in Bangladesh, identify major barriers and enablers, and highlight opportunities and policy options to accelerate progress toward UHC. Narrative review of published literature, policy papers, and programme reports (2010–2025) focusing on marginalized populations and UHC in Bangladesh, emphasizing service coverage, financial protection, and equity. Marginalized groups-defined by poverty, geography, ethnicity, gender, disability, or informal employment- face disproportionate barriers to essential services and financial protection. Out-of-pocket (OOP) health spending remains high (~11% of household budgets), pushing many families into poverty. Although the Government of Bangladesh has committed to achieving UHC by 2030, barriers such as under-financing, governance gaps, and inequitable access persist. Achieving UHC in Bangladesh requires an explicitly pro-equity approach targeting marginalized populations first. With sustained political commitment, innovative financing, and inclusive governance, Bangladesh can move closer to the SDG 3.8 target of leaving no one behind.

Keywords: *Universal health coverage, marginalized populations, equity, Bangladesh, SDGs, financial protection*

1. Prof. Dr. Kazi Shafiaul Halim, Professor of epidemiology, Placement of Health Service Division, Ministry of Health & family Welfare, Bangladesh.

INTRODUCTION

Universal health coverage (UHC) ensures that 'all people' can access quality health services without financial hardship, aligning with SDG 3.8[1]. Bangladesh has achieved notable gains in child and maternal health and infectious disease control, yet inequities remain profound[2].

Marginalized populations including urban slum dwellers, indigenous communities, people living in coastal chars, refugees, informal workers, and women in poverty often experience multidimensional exclusion[3]. This review explores the scope and opportunities for UHC among marginalized groups in Bangladesh, summarizing barriers, enablers, and strategic pathways to equitable coverage.

Current Status and Equity Gaps

1. Service Coverage Gaps: Bangladesh's UHC service coverage index was reported as 52/100 in 2021[4]. However, marginalized populations experience much lower effective coverage. Studies from coastal and remote areas reveal significant disparities in healthcare access between rich and poor households[5]. Urban slums also remain under-served, with reliance on informal and unregulated providers[3].

2. Financial Protection: Financial hardship is a defining constraint. Average household OOP health spending is about 11% of total expenditure, with catastrophic expenditure affecting up to one-quarter of households[6]. Poorer groups are disproportionately impacted, often foregoing care or resorting to high-interest loans.

3. Geographic and Social Exclusion: Residents of hard-to-reach areas such as chars, hill tracts, border premises and remote islands face limited facility density, higher travel costs, and workforce shortages[7]. Ethnic minorities, refugees, farmers, laborers and people with disabilities face linguistic, cultural, or stigma-related barriers[3].

4. Policy and Programme Context: Bangladesh's Seventh Five-Year Plan, Health Care Financing Strategy 2012–2032, and the Social Security Strategy all incorporate UHC principles[8]. In 2023, the Government reaffirmed its UHC commitment with focus on equity and essential service packages[9]. Despite this, implementation remains fragmented due to weak governance, insufficient funds, and poor coordination between government, NGO, and private sectors[7].

Barriers to UHC for Marginalized Populations

1. Under-financing of the Health Sector: Public health expenditure (~0.7% of GDP) remains among the lowest globally[10]. This limits primary care expansion, infrastructure, and human resources in underserved areas.

2. Fragmented Governance and Weak Regulation: Multiple public–private actors operate without unified standards, hampering accountability[7].

3. Demand-Side Constraints: Sociocultural barriers, poor health literacy, and distrust of formal systems prevent care-seeking among marginalized groups[3].

4. Inadequate Targeting: Existing programmes often overlook informal workers, ethnic minorities, and slum populations[7].

5. Workforce and Quality Gaps: Rural and remote regions suffer from staff shortages, absenteeism, and poor service readiness[11].

6. Informal Economy: Over 85% of Bangladesh's labour force works informally, complicating contributory insurance schemes[7].

Opportunities and Enabling Pathways

1. Political Commitment- Bangladesh's renewed pledge to accelerate UHC by 2030 provides a strong foundation for inclusive reforms[9].

2. Phased, Pro-Equity Approach- The "progressive universalism" model advocates prioritizing the poorest first[8]. UHC roll out can begin with marginalized areas (slums, hill tracts, refugee camps), offering subsidized essential services before scaling nationally.

3. Innovative Financing and Insurance- Prepayment schemes such as- 'Shasthyo Surokhsha Karmasuchi (SSK)' target poor households through subsidized insurance[12]. Expanding these pilots and pooling funds from government, donors, and cross-subsidies can enhance financial protection.

4. Outreach and Technology- Community-based services, telemedicine, and mobile clinics have demonstrated success in coastal and hard-to-reach areas[5]. Expanding these models ensures equitable service delivery.

5. Public-Private Partnerships- Non-state providers account for over 60% of care utilization. Structured contracts, accreditation, and regulation can integrate these actors within UHC for marginalized populations[13].

6. Strengthened Data and Accountability- Equity-disaggregated data (by gender, income, ethnicity, and location) are vital to monitor progress. Transparent dashboards and citizen oversight can enhance accountability.

7. Workforce Redistribution and Incentives- Incentivizing deployment to remote areas, improving working conditions, and career progression for rural health workers will address persistent service gaps[11].

Planning to Implementation Framework for UHC among Marginalized Populations in Bangladesh

The following framework illustrates the sequential process from planning to impact, highlighting critical components for achieving Universal Health Coverage (UHC) among marginalized populations in Bangladesh. It aligns with the Sustainable Development Goals (SDGs), particularly SDG 3.8, focusing on equity, inclusiveness, and system strengthening.

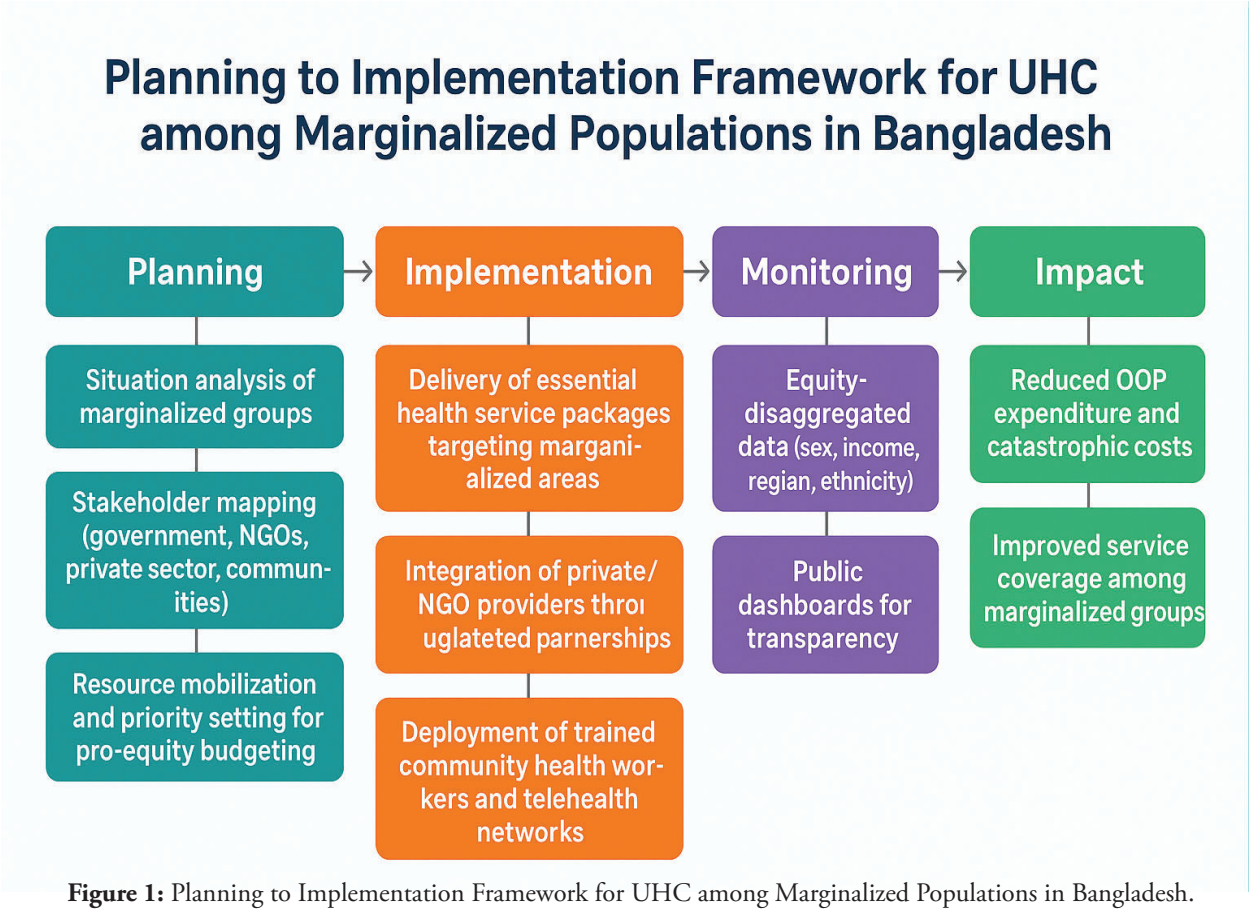


Figure 1: Planning to Implementation Framework for UHC among Marginalized Populations in Bangladesh.

DISCUSSION

Bangladesh stands at a crossroads between progress and exclusion. UHC advancement without explicit equity targeting risks deepening disparities. Marginalized groups face a dual disadvantage- limited access and severe financial vulnerability. Global evidence supports a 'pro-poor, phased implementation model' in which the poorest populations receive subsidized essential packages first, supported by strong primary care and pooled financing[14]. Governance reforms are equally crucial: decentralizing decision-making, regulating private providers, and ensuring quality through performance monitoring[7]. Without substantial increases in domestic public spending and efficient resource use, Bangladesh may fall short of SDG 3.8. An integrated multisectoral approach linking health with education, housing, and social protection can amplify UHC outcomes.

CONCLUSION

Marginalized populations are at the heart of Bangladesh's UHC challenge. Achieving equitable UHC requires strategic investments, inclusive planning, and governance reforms that empower communities. With targeted interventions, Bangladesh can turn its strong policy intent into practical, equitable outcomes by 2030.

Policy Recommendations

Increase public health spending- to at least 2% of GDP with earmarked funds for marginalized areas. Adopt a pro-equity, phased UHC roll out- prioritizing slums, coastal and hilly regions, and vulnerable groups. Expand prepayment and pooling mechanisms- with targeted subsidies. Strengthen primary care delivery- via community health workers, telemedicine, and outreach services. Engage private and NGO sectors- through regulation, quality assurance, and contracts targeting marginalized communities. Ensure dis-aggregated monitoring and accountability- frameworks for UHC equity indicators. Link UHC with social protection programmes- to address non-medical determinants of exclusion.

Acknowledgements: We acknowledge [Institution/Team] for providing insights and data resources.

Competing interests: None declared.

Funding: None.

Provenance and peer review: Not commissioned; externally peer reviewed.

REFERENCES

1. World Health Organization. Universal Health Coverage: Moving Together to Build a Healthier World. Geneva: WHO; 2021.
2. Hoque R, Jahan N, Bitrán R. Universal Health Coverage in Bangladesh: Activities, Challenges, and Suggestions. BMC Public Health 2020; 20:769.
3. BRAC Advocacy Programme. Current Scenario of the Marginalized Population in Bangladesh. Dhaka: BRAC; 2020.
4. Dhaka Tribune. Unlocking Universal Health Coverage. Dhaka Tribune 2024.
5. Iqbal MH. Disparities of Health Service for the Poor in the Coastal Area. Access Health Policy 2019; 7:1575683.
6. Ahmed S et al. Inequalities in Financial Risk Protection in Bangladesh: Assessment of Universal Health Coverage. Int J Equity Health 2017; 16:58.
7. Hoque R et al. Challenges and Suggestions for UHC Implementation in Bangladesh. BMC Public Health 2020; 20:769.[7]
8. Government of Bangladesh. Health Care Financing Strategy 2012–2032. Dhaka: MoHFW; 2012.
9. Government of Bangladesh and UN Bangladesh. Commitment to Accelerate UHC by 2030. Press Release; 2023.
10. The Business Standard. Private Sector—The Missing Link in UHC Achievement. 2024.
11. Daily Asian Age. Why Bangladesh Needs Universal Health Coverage. 2023.
12. The Business Standard. Universal Health Coverage Key to Reducing Inequality. 2024.
13. The Business Standard. Engaging the Private Sector for UHC. 2024.
14. World Bank. Progressive Universalism and Health Financing. Washington DC: World Bank; 2020.