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EDITORIAL

Artificial Intelligence and Medical Education

Dr. Md. Marufuzzaman[1]

The contribution of artificial intelligence (AI) in present times cannot be ignored. AI is a machine possessing intelligent capabilities—such as learning, communication, information processing, and induction—that can either perform human functions or aid humans in performing them [1]. The term "artificial intelligence" was first coined by John McCarthy in 1955 [2]. AI has a role in every sector of life, including medical education. Medical education is the formal training process for healthcare professionals, focused on equipping them with the scientific knowledge, clinical skills, and ethical conduct required for practice. In contrast to the prevalent utilization of AI in medical practice, its usage in medical education was not widely considered until the 1980s [3]. Although medical education evolved from ancient Greek rational inquiry, the use of AI in medical education has gained marked development since the onset of the COVID-19 era.

During the COVID-19 pandemic, AI was successfully applied to the interpretation of chest CT imaging, displaying rapid and accurate diagnostic capabilities that, in several studies, surpassed human sensitivity in detecting lung pathologies [4]. The role of AI in medical education now extends from data management and cognitive skill development to robotics and simulations, preparing future clinicians for a rapidly evolving healthcare landscape.

Artificial intelligence (AI) is rapidly revolutionizing medical education by enhancing learning methodologies, improving training efficiency, and providing personalized education experiences [5]. The integration of AI in medical education represents both a technological evolution and a paradigm shift in how medical knowledge is acquired, applied, and retained [6]. The traditional model of medical education has been structured around classroom-based learning, cadaver dissections, clinical apprenticeships, and hands-on experience with patients. While these methods remain effective, they possess inherent limitations, including information overload, variability in teaching quality, difficulty in standardizing training across institutions, and challenges in ensuring personalized learning. AI presents an opportunity to address these limitations by leveraging data-driven approaches, automation, and intelligent feedback mechanisms to create a more efficient, student-centric learning experience [7]. Additionally, AI enables the development of dynamic, adaptive, and interactive learning environments [8]. Unlike traditional textbooks and lectures, which are often static and require students to consume information passively, AI-driven tools—such as virtual simulations, interactive case studies, and augmented reality (AR) applications—transform learning into an active process. In these simulated environments, students can engage with real-life scenarios in a risk-free setting. This approach facilitates hands-on skill development while simultaneously enhancing critical thinking and clinical decision-making abilities.

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Opportunities of AI in medical education include AI-powered virtual patients, AI-based human body models, and AI-based anatomical education and pre-surgical assessment. Furthermore, it facilitates medicine-machine interaction training and AI-driven personalized learning. Alongside these opportunities are significant challenges. The obstacles to introducing AI in medical education comprise- Ethical concerns, such as data privacy, algorithmic bias, and professional accountability. Faculty training and professional development. Curriculum design integration. Resource and infrastructure requirements. Evaluation and assessment methodologies. Collaboration with AI technical experts. Multiple reviews highlight AI's potential to transform specialized fields—specifically oncology, radiology, and pathology—while emphasizing these systemic challenges [9].

AI products play a crucial role in addressing healthcare problems worldwide. The World Health Organization (WHO) recognizes health technologies and AI-based products as vital components of healthcare delivery, aiming to ensure an additional 1 billion patients receive health coverage, emergency care, and improved health conditions [10].

Numerous countries, including China and South Korea, have already incorporated AI into their primary education curricula. Without proper instruction, the sporadic or unregulated use of AI can lead to a significant wastage of time. Therefore, the government should treat AI as a time-sensitive, high-priority issue and integrate it into every sector of education—including medical education. This strategic shift will ensure that healthcare professionals are equipped to navigate modern technology and the demands of a rapidly evolving world.

References

1. Nilsson NJ, Nilsson NJ. Artificial Intelligence: A New Synthesis. Morgan Kaufmann; 1998.

2. McCarthy J, Minsky M, Rochester N, Shannon C. A proposal for the Dartmouth summer research project on artificial intelligence, August 31, 1955. AI Magazine. 2006;27:12–4.

3. Lillehaug S-I, Lajoie SP. AI in medical education—another grand challenge for medical informatics. Artif Intel Med. 1998;12(3):197–225.

4. 6. Jin C, Chen W, Cao Y, et al. Development and evaluation of an artificial intelligence system for COVID-19 diagnosis. Nat Commun 2020; 11: 5088.

5. Narayanan S, Ramakrishnan R, Durairaj E, Das A: Artificial intelligence revolutionizing the field of medical education. Cureus. 2023, 15:e49604. 10.7759/cureus.49604

6. Andrade JB, Mendes GN, Silva GS: Miller Fisher's rules and digital health: the best of both worlds . Cerebrovasc Dis. 2024, 1-8. 10.1159/000539323.

7. Jeyaraman M, Balaji S, Jeyaraman N, Yadav S: Unraveling the ethical enigma: artificial intelligence in healthcare. Cureus. 2023, 15:e43262. 10.7759/cureus.43262

8. Krishna R, Lee D, Fei-Fei L, Bernstein MS: Socially situated artificial intelligence enables learning from human interaction. Proc Natl Acad Sci U S A. 2022, 119:e2115730119. 10.1073/pnas.2115730119.

9. Wang S, Yang DM, Rong R, et al. Pathology image analysis using segmentation deep learning algorithms. Am J Pathol 2019; 189: 1686–1698.

10. Kolachalama VB. Machine learning and pre-medical education. Artif Intel Med. 2022;129, 102313.

Original Article

Anemia among Garments Workers of Chattogram Attending at (Karnaphuli) EPZ Hospital

Borna Chowdhury[1], *A. B. M. Zafar Sadeque[2], Md. Abirul Islam[3], Mohammed Arman[4], Anan Das[5], Nilufar Yeasmin[6]

Abstract

Background: Anemia is a condition characterized by a reduced number of red blood cells or a decreased concentration of hemoglobin in the blood, resulting in diminished oxygen-carrying capacity. It may occur due to decreased production of red blood cells, increased destruction, or excessive blood loss. Among ready-made garment (RMG) workers, anemia is particularly common owing to inadequate nutrition and limited income that restricts access to healthy food. Despite multiple contributing factors, anemia-related determinants specific to this occupational group have not been adequately explored in previous studies. Therefore, this study aimed to determine the proportion of RMG workers affected by anemia and to identify the factors significantly associated with its occurrence. **Methodology:** This descriptive cross-sectional study was conducted at Bangladesh Export Processing Zone Authority (BEZPA) Hospital from August 2020 to January 2021. A total of 110 RMG workers who attended the hospital during the study period were enrolled. Hemoglobin levels were measured, and participants were interviewed using a pre-tested, structured questionnaire. Data were compiled in a master sheet and analyzed using SPSS version 23. **Results:** All participants were found to have anemia of varying severity. Among male workers, 4 (8.7%) had mild anemia, 41 (89.1%) had moderate anemia, and 1 (2.2%) had severe anemia. Among female workers, 1 (1.6%) had mild anemia, 46 (71.9%) had moderate anemia, and 17 (26.6%) had severe anemia. Statistical analysis revealed that smoking ($p < 0.001$) and regular deworming ($p = 0.002$) were significantly associated with a lower prevalence of anemia, indicating their potential protective role. **Conclusion:** Anemia is highly prevalent among RMG workers. Implementation of workplace health education programs and provision of at least one nutritious meal per day could substantially improve the workers' health, productivity, and overall quality of life.

Keywords: Anemia, garments workers, EPZ, risk factors, RMG workers.

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Introduction

Anemia is a condition characterized by a reduction in circulating red blood cell (RBC) mass and a decrease in the concentration of hemoglobin (Hb) in the blood [1]. The World Health Organization (WHO) defines anemia as hemoglobin levels below 12.0 g/dL in women and below 13.0 g/dL in men [2]. A lower reference value is accepted for women because of regular menstrual blood loss. However, normal hemoglobin distribution varies not only by sex but also by ethnicity and physiological status [2]. Based on mean corpuscular volume (MCV), anemia can be classified into microcytic (MCV < 80 fL), normocytic (MCV = 80–100 fL), and macrocytic (MCV > 100 fL) anemia [3]. Macrocytic anemia is commonly caused by folate or vitamin B12 deficiency and bone marrow malignancies [4], normocytic anemia is often associated with chronic diseases [5], while microcytic anemia generally results from iron deficiency within the body [6].

Hemoglobin consists of two key components: the heme part, composed of iron (ferrous) and protoporphyrin, and the globin part, which includes two alpha and two beta globin chains [7]. Hemoglobin resides within red blood cells and plays a vital role in oxygen transport to tissues and organs. A reduction in hemoglobin concentration results in decreased oxygen delivery, producing symptoms such as weakness, fatigue, dyspnea, pallor, lightheadedness, and headache; patients with coronary artery disease may experience angina due to reduced oxygen supply [8].

Anemia is typically diagnosed through hemoglobin level, hematocrit, and red blood cell count measurements [9]. As these indices are volume-dependent, conditions causing hemodilution may yield artificially low values. For example, in pregnancy, plasma volume increases, diluting blood and lowering hemoglobin levels [10]. Due to monthly menstrual blood loss and increased iron demands during pregnancy, women of reproductive age are at high risk of anemia [11].

Anemia remains a global public health concern affecting individuals of all ages in both developing and developed countries [12]. It has major consequences for human health and imposes substantial social and economic burdens. Gardner and Kassebaum [13] reported an estimated global anemia prevalence of 22.8% between 1990 and 2019. Although prevalence decreased slightly over time, incidence rose from 1.42 billion in 1990 to 1.74 billion in 2019. Among these, 54.1% were mild, 42.5% moderate, and 3.4% severe cases. The highest burden was found in Western and Central Sub-Saharan Africa and South Asia. Globally, the most common etiologies were dietary iron deficiency, vitamin A deficiency, and beta-thalassemia trait [13].

Similarly, McLean et al. [12] analyzed WHO Vitamin and Mineral Nutrition Information System data (1993–2005) and found that while children had the highest anemia prevalence globally due to nutritional deficiencies, in South Asia, women of reproductive age were disproportionately affected, largely due to menstrual blood loss and repeated pregnancies. In Bangladesh, the prevalence of anemia has declined over the past two decades in most groups except adult men, with urban populations showing lower rates than rural ones [1]. According to Ahmed [1], anemia prevalence in rural Bangladesh was 43% among adolescent girls, 45% among non-pregnant women, and 49% among pregnant women. Although childhood anemia prevalence has dropped by about 30%, it remains high (≈53%) compared with international standards. The predominant form is iron deficiency anemia, mostly arising from inadequate nutrition and parasitic infestations—both preventable and reversible causes.

The ready-made garments (RMG) industry is

one of the most significant sectors in Bangladesh's economy. According to Mia and Akter [14], the RMG sector contributes approximately 83.9% of the country's total export earnings, with 12.26% of the gross domestic product (GDP) in fiscal year 2017–2018. The industry employs over four million workers, the majority of whom are women [14, 15]. Despite its economic importance, this sector faces numerous challenges, including low wages, unsafe working environments, job insecurity, and inadequate recognition of female workers' rights [15]. These socioeconomic constraints often lead to poor dietary intake and limited access to healthcare. Consequently, a recent study found that 77–80% of female Bangladeshi garment workers were anemic [16]. This contributes to reduced productivity, increased maternal and perinatal mortality, and broader economic losses. Among male workers, exposure to arsenic-contaminated drinking water has also been linked to anemia [17].

Given the persistently high prevalence of anemia in this population, compounded by occupational stress, inadequate nutrition, and limited healthcare access, it is crucial to identify the underlying factors specific to this group. Hence, the present study aims to determine the proportion of anemic RMG workers and to identify the risk factors significantly associated with anemia among them.

Methods

The study was conducted at the Bangladesh Export Processing Zone (BEPZA) Hospital in Chattogram, Bangladesh, over a period of six months from June 2021 to November 2021. It followed a descriptive cross-sectional design and included all ready-made garment (RMG) workers attending the outpatient department (OPD) of BEPZA Hospital during the study period. Convenience sampling was used to recruit participants, where eligible workers who met the inclusion criteria and provided informed consent were enrolled consecutively until the desired sample size was reached. The inclusion criteria comprised workers aged between 16 and 60 years, of both sexes, employed in the garment sector within BEPZA, and willing to participate in the study. Relatives of garment workers attending the hospital and workers with previously diagnosed medical conditions such as thalassemia, sickle cell anemia, or bone marrow malignancies were excluded to avoid confounding variables.

Before data collection, written permission was obtained from the hospital director, and informed written consent was collected from each participant after explaining the purpose and procedure of the study. Confidentiality was strictly maintained throughout the process by ensuring that no identifying information was used and all collected data were stored securely. Data were collected using a pre-tested, semi-structured questionnaire along with physical examination tools such as a stethoscope, sphygmomanometer, thermometer, and stopwatch to record vital parameters. Participants were interviewed face-to-face, after which they were referred to the hospital laboratory for hemoglobin estimation. The obtained laboratory results were compiled in Microsoft Excel and checked for completeness and consistency. Incomplete or ambiguous questionnaires were excluded from analysis. The cleaned dataset was then entered into SPSS version 23 for statistical analysis, and results were presented in the form of tables and charts.

Results

The mean age of the respondents was 28.46 (95% confidence interval (CI) between 26.7-30.22 years). Among the respondents, 64(58.2%) were female and 46(41.8%) were males. About 87(79.9%) respondents were married. The average monthly income was Tk 14,146.36 (95% CI between 12,892.99-

15399.73 Taka). A total of 66 (60%) respondents had at least completed secondary education and majority of the respondents 53(48.2%) belonged to lower middle class.

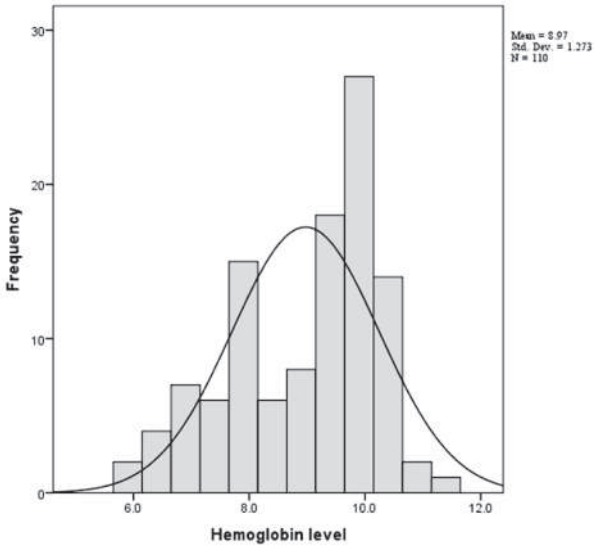

Figure 1: Overall hemoglobin levels of the study respondents (n=110).

The histogram above represents the frequency distribution of the respondents based on their levels of hemoglobin. The mean hemoglobin level was 8.97±1.27. The minimum hemoglobin level observed was 5.9gm/dl and the maximum were 11.3gm/dl. The highest frequency was observed when hemoglobin level was 10.0gm/dl. Twenty-six respondents had this level of hemoglobin.

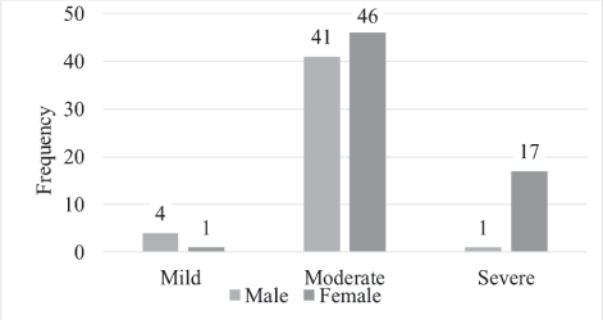

Figure 2: Distribution of the study subjects based on categories of hemoglobin levels (n=110)

The bar chart above displays the distribution of study subjects based on the level of hemoglobin in blood. Most of the patients had moderate levels of anemia. In case of male patients, 41 (89.1%) respondents had moderate anemia, 4(8.7%) men had mild anemia and the remaining 1(2.2%) person had severe anemia. For female subjects that included both pregnant and non-pregnant women, majority (71.9%) had moderate anemia, followed by severe anemia in 17 (26.6%) women. Only one woman (1.6%) had mild anemia. None of the respondents were non-anemic according to WHO criteria.

Table 1: Association of Anemia with Selected Factors.

Association of anemia with pregnancy (n=64)			
Pregnant	**Frequency (%)**	**Mean hemoglobin levels**	**P- value**
Yes	5 (7.8%)	7.9±1.4	0.29
No	59 (92.2%)	8.6±1.3	
Association of anemia with lactation (n=64)			
Lactating	**Frequency**	**Mean hemoglobin level**	**P- value**
Yes	15 (23%)	8.6±1.4	0.98
No	49 (77%)	8.6±1.3	
- Deworming program and anemia (n=110)			
Deworming	**Frequency**	**Mean hemoglobin level**	**P- value**
Yes	87 (79%)	9.1±1.1	0.002
No	23 (21%)	8.6±1.7	
Association of anemia with taking oral contraceptive pills (n=64)			
OCP intake	**Frequency**	**Mean hemoglobin level**	**P- value**
Yes	36 (56%)	8.7±1.3	0.42
No	28 (44%)	8.4±1.4	
Association of anemia with smoking (n=110)			
Smoker	**Frequency**	**Mean hemoglobin level**	**P- value**
Yes	45 (41%)	9.6±0.9	***<0.001***
No	65 (59%)	8.6 ± 1.3	

Among the 64 female respondents included in this study, 5 (7.8%) were pregnant, while the remaining 59 (92.2%) were not. The mean hemoglobin level of pregnant participants was 7.9 ± 1.4 g/dL, whereas that of non-pregnant women was 8.6 ± 1.3 g/dL. When a Student's t-test was performed to compare mean hemoglobin levels between the two groups, no statistically significant difference was found (p = 0.29), indicating that pregnancy status was not significantly associated with anemia in this sample.

With regard to lactation, 15 (23%) of the 64 female respondents were lactating mothers, while 49 (77%) were not. The mean hemoglobin level among lactating women was 8.6 ± 1.4 g/dL, compared to 8.6 ± 1.3 g/dL among non-lactating women. Statistical analysis using a Student's t-test showed no significant association between lactation status and hemoglobin concentration (p = 0.98).

Deworming practices were found to have a notable effect on anemia status. Among the 110 respondents, 87 (79%) reported taking deworming medication within the previous three months, while 23 (21%) had not. The mean hemoglobin level was significantly higher in those who underwent deworming (9.1 ± 1.1 g/dL) compared to those who did not (8.6 ± 1.7 g/dL), and this difference was statistically significant (p = 0.002*). This suggests that regular deworming has a positive association with higher hemoglobin levels and may play a preventive role against anemia.

The relationship between oral contraceptive pill (OCP) use and hemoglobin concentration was also examined among female participants. Out of 64 women, 36 (56%) reported using OCPs, while 28 (44%) did not. The mean hemoglobin level of OCP users was 8.7 ± 1.3 g/dL, compared to 8.4 ± 1.4 g/dL among non-users. The difference was not statistically significant (p = 0.42*), indicating no observable impact of OCP use on hemoglobin levels in this study population.

Smoking status showed a strong and statistically significant association with hemoglobin concentration. Among the 110 respondents, 45 (41%) were smokers and 65 (59%) were non-smokers. The mean hemoglobin level was 9.6 ± 0.9 g/dL among smokers and 8.6 ± 1.3 g/dL among non-smokers. The difference between the two groups was highly significant (p < 0.001*), suggesting that smoking may lead to higher measured hemoglobin levels, possibly due to compensatory erythrocytosis in response to chronic exposure to carbon monoxide.

Discussion

Anemia is a serious global public health problem that particularly affects young children and pregnant women. World Health Organization estimates that 4 2% of children less than 5 years of age and 40% of pregnant women worldwide are anemic [18]. However, in this study, even men working at KEPZ were anemic. In fact, none of the study subjects had normal levels of hemoglobin based on WHO criteria. Yet significant differences in severity of anemia was observed among patients with some risk factors.

Among the workers, the mean age of all workers was 28.46 ± 9.31 with a male: female ratio of 1: 1.4. The patient demographics are similar to another study conducted in Bangladesh by Khatun and Alam et al. [19] where mean age was 24.85 ±7.11 years. In cases of hemoglobin levels, the overall mean hemoglobin level among all respondents was 8.97 ± 1.27 (Fig.2). In other words, all respondents were moderately anemic according to WHO criteria. When categorizing it based on gender and pregnancy status, among females, 1.6% had mild anemia, 71.9% had moderate anemia and 26.6% had severe anemia (Fig.2). In case of male respondents, 8.7% had mild anemia, 89.1% had moderate anemia and 2.2% had severe anemia. None of the study subjects had normal hemoglobin levels. This is very different from another study conducted in Bangladesh by Khatun et al. in 2013where at least 23% of females and 89% males had normal hemoglobin levels [19].

When looking at risk factors for anemia, significant association was found for smoking (p <0.001) (Table- 1) and deworming (p=0.002) (Table- 1). Both had a positive effect on hemoglobin levels. In case of anemia among smokers versus non-smokers, a highly significant associ-

ation ($p<0.001$) was found between the two. Smokers were significantly more likely to display higher levels of hemoglobin than non-smokers. A similar observation of Nordenberg et al. was reported in another study in 1990 where female smokers showed significantly higher mean levels of hemoglobin as compared to nonsmoking females [20]. This is because cigarette smoking seems to cause a generalized upward shift of the hemoglobin distribution curve, which reduces the utility of hemoglobin level to detect anemia. Carbon monoxide in the smoke blocks oxygen attachment to the red cells' empty hemoglobin slots. The body panics, interpreting low hemoglobin as a signal to increase red cell production. Hemoglobin rises, and so do red cells.

As for worm infestation, these reside in the small intestine of infected individuals where they attach themselves to the villi and feed on host blood. Among individuals with inadequate iron intake and high physiological demands, this blood loss can result in anemia. According to a meta-analysis by Smith and Brooker, a significant improvement in levels of hemoglobin were observed among non-pregnant people infested with hookworm when treated with Albendazole [21]. This finding supports our result that deworming can have a significant impact on hemoglobin levels.

In case of oral contraceptive pill ingestion, no significant difference was observed among users and non-users (Table- 1). Although below normal levels, mean hemoglobin levels were slightly better among OCP users. This is similar to another study involving data from low and middle income countries where improvement in levels of hemoglobin were observed among current and continuous OCP users- a non-contraceptive benefit of OCP use [22]. Since the type of OCP used by respondents could not be recorded due to risk of recall bias, it could not be specified, which kind of OCP showed better benefits in this regard. Furthermore, in this study most women were anemic irrespective of OCP use due to inconsistency with use.

Among lactating women in this study, mean levels of hemoglobin were almost the same between lactating and non-lactating women (Table- 1). This is contrary to an Indian study performed by Kapur et al. in 2002, where lactating women had lower hemoglobin levels than pregnant women suggesting severe nutritional deficiency among them [23]. However, another study from Ethiopia found pregnant mothers to be more anemic than lactating mothers [24]. The result in this research work could be explained by the fact that women irrespective of their pregnancy or lactation status were enrolled and hence, no difference was observed between lactating and non-lactating women.

One other important finding in this study was the association of pregnancy with severe anemia. According to the classification of World Health Organization (WHO), pregnant women with hemoglobin levels less than 11.0 g/dl in the first and third trimesters and less than 10.5 g/dl in the second trimester are considered anemic [25]. In this study, the mean hemoglobin levels of pregnant women were 7.9±1.4 g/dl (Table 1) which is much lower than the WHO criteria. Even among the non-pregnant women, the mean was 8.6±1.3 g/dl which is much less than the cut-off points for pregnant women. Anemia in pregnancy is associated with increased rates of maternal and perinatal mortality, premature delivery, low birth weight, and other adverse outcomes. Low levels of hemoglobin during pregnancy can lead to low birth weight babies and intrauterine growth retardation [25]. One finding that could not be observed in this work is the proportion of worm infestation among the patients, especially among the pregnant women. Evidence from studies indicates that

increasing hookworm infection intensity is associated with lower haemoglobin levels in pregnant women in poor countries [26]. However, recent reports by the World Health Organization claim a positive effect on child survival and health by deworming pregnant women [27, 28]. Hence, deworming can be an effective method in improving hemoglobin levels by preventing blood loss irrespective of pregnancy status.

Conclusion

All study subjects had some form of anemia with majority of them having moderate to severe anemia. While, smoking and deworming played a significant role in improving hemoglobin levels among the study subjects, pregnancy showed a negative impact and lactation did not show any impact on mean hemoglobin levels among the study subjects. Appropriate measures need to be taken to improve the health status of workers at the garments factories so that less absence for sick days is taken and the workers can be more efficient when performing their duties, thus overall increasing productivity.

Limitations

Due to pandemic situation, the sample size of the study was much smaller than the calculated sample size. Study involving a large sample size would have yielded better results. Data was collected from hospital patients; hence only sick individuals were included in the study. A simple random sampling of all people working at BEZPA would have given more accurate idea on hemoglobin concentrations among workers. Although identified cases of chronic medical conditions that could lead to anemia has been excluded, undiagnosed cases who had approached the hospital could not be excluded and hence may have biased the results. A comparison of anemic status based on urban or rural residence was not possible since all respondents lived in urban areas.

Recommendations

Conducting a nationwide study involving all garments factories can help us achieve a better idea on the actual condition of garments factory workers in Bangladesh. This in turn can help us identify variations in health status among workers at different locations and focus on providing health education for places requiring high priority. Since simple methods such as deworming and improved nutrition or iron supplementation can help mitigate the severity of anemia among most of the working population, free health checkups and supplementation of these drugs can improve the health of workers and hence increase productivity.

References

1. Ahmed F. Anaemia in Bangladesh: a review of prevalence and aetiology. Public Health Nutr. 2000 Dec;3(4):385-93.

2. Cappellini MD, Motta I. Anemia in clinical practice—definition and classification: does hemoglobin change with aging? Semin Hematol. 2015 Oct 1;52(4):261-9.

3. Schop A, Stouten K, Riedl JA, van Houten RJ, Leening MJ, Bindels PJ, et al. The accuracy of mean corpuscular volume-guided anaemia classification in primary care. Fam Pract. 2021 Dec;38(6):735-9.

4. Takahashi N, Kameoka J, Takahashi N, Tamai Y, Murai K, Honma R, et al. Causes of macrocytic anemia among 628 patients: mean corpuscular volumes of 114 and 130 fL as critical markers for categorization. Int J Hematol. 2016 Sep;104(3):344-57.

5. Brill JR, Baumgardner DJ. Normocytic anemia. Am Fam Physician. 2000 Nov 15;62(10):2255-63.

6. Shine JW. Microcytic anemia. Am Fam Physician. 1997 May 1;55(7):2455-62.

7. Thomas C, Lumb AB. Physiology of haemoglobin. Contin Educ Anaesth Crit Care Pain. 2012 Oct 1;12(5):251-6.

8. Sattar HA. Fundamentals of Pathology: Med-

ical Course and Step 1 Review. Pathoma; 2019.
9. Kundrapu S, Noguez J. Laboratory assessment of anemia. Adv Clin Chem. 2018 Jan 1;83:197-225.
10. Hytten F. Blood volume changes in normal pregnancy. Clin Haematol. 1985 Oct 1;14(3):601-12.
11. Gautam S, Min H, Kim H, Jeong HS. Determining factors for the prevalence of anemia in women of reproductive age in Nepal: evidence from recent national survey data. PLoS One. 2019 Jun 12;14(6):e0218288.
12. McLean E, Cogswell M, Egli I, Wojdyla D, De Benoist B. Worldwide prevalence of anaemia, WHO Vitamin and Mineral Nutrition Information System, 1993–2005. Public Health Nutr. 2009 Apr;12(4):444-54.
13. Gardner W, Kassebaum N. Global, regional, and national prevalence of anemia and its causes in 204 countries and territories, 1990–2019. Curr Dev Nutr. 2020 Jun;4(Suppl 2):830.
14. Mia S, Akter M. Ready-made garments sector of Bangladesh: its growth, contribution and challenges. Economics. 2019 Jan;7(1):17-26.
15. Islam MS, Rakib MA, Adnan AT. Ready-made garments sector of Bangladesh: its contribution and challenges towards development. Stud. 2016 Jun;5(2).
16. Hossain M, Islam Z, Sultana S, Rahman AS, Hotz C, Haque M, et al. Effectiveness of workplace nutrition programs on anemia status among female readymade garment workers in Bangladesh: a program evaluation. Nutrients. 2019 Jun;11(6):1259.
17. Heck JE, Chen Y, Grann VR, Slavkovich V, Parvez F, Ahsan H. Arsenic exposure and anemia in Bangladesh: a population-based study. J Occup Environ Med. 2008 Jan 1;50(1):80-7.
18. World Health Organization. Worldwide Prevalence of Anaemia 1993–2005: WHO Global Database on Anaemia. Geneva: WHO; 2008.
19. Khatun T, Alamin A, Saleh F, Hossain M, Hoque A, Ali L. Anemia among garment factory workers in Bangladesh. Middle-East J Sci Res. 2013;16(4):502-7.
20. Nordenberg D, Yip R, Binkin NJ. The effect of cigarette smoking on hemoglobin levels and anemia screening. JAMA. 1990 Sep 26;264(12):1556-9.
21. Smith JL, Brooker S. Impact of hookworm infection and deworming on anaemia in non-pregnant populations: a systematic review. Trop Med Int Health. 2010 Jul;15(7):776-95.
22. Bellizzi S, Ali MM. Effect of oral contraception on anemia in 12 low- and middle-income countries. Contraception. 2018 Mar 1;97(3):236-42.
23. Kapur D, Agarwal KN, Agarwal DK. Nutritional anemia and its control. Indian J Pediatr. 2002 Jul;69(7):607-16.
24. Feleke BE, Feleke TE. Pregnant mothers are more anemic than lactating mothers: a comparative cross-sectional study, Bahir Dar, Ethiopia. BMC Hematol. 2018 Dec;18(1):1-7.
25. Tabrizi FM, Barjasteh S. Maternal hemoglobin levels during pregnancy and their association with birth weight of neonates. Iran J Pediatr Hematol Oncol. 2015;5(4):211-5.
26. Brooker S, Hotez PJ, Bundy DA. Hookworm-related anaemia among pregnant women: a systematic review. PLoS Negl Trop Dis. 2008 Sep 17;2(9):e291.
27. World Health Organization. Deworming for Health and Development: Report of the Third Global Meeting of the Partners for Parasite Control. Geneva: WHO; 2005.
28. Malhotra N, Roy D. Deworming during pregnancy and birth outcomes. 2018.

Original Article

Clinical Profile and Antibiotic Sensitivity Pattern of Enteric Fever among Children Admitted in a Tertiary Care Hospital in Satkhira

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Abstract

Background: Enteric fever remains a major public health problem in Bangladesh, particularly among children, due to unsafe water, poor sanitation, and emerging antimicrobial resistance. **Objective:** To assess the clinical profile and antibiotic sensitivity pattern of enteric fever among children admitted to a tertiary care hospital in Satkhira. **Methods:** A prospective observational study was carried out in the Pediatric Inpatient Department of Satkhira Medical College Hospital from October 2023 to September 2024. All children aged ≤14 years admitted with suspected enteric fever were included. A clinic diagnosis was made in 147 children, from whom 81 were laboratory-confirmed cases by blood culture and/or significant Widal test (TO ≥1:160). Clinical characteristics, laboratory results, associated complications and antimicrobial susceptibility pattern of the S. enterica isolates were collected and analyzed. **Results:** The majority of the affected children were > 5 years old (70.4%) and the female to male ratio was 1:1.3. Fever and anorexia occurred in all the patients; they were followed by abdominal pain and symptoms GI. Frequent clinical findings were tachycardia (93.8%), pallor (74.1%), coated tongue (65.4%) and hepatomegaly (42.0%). Blood culture and Widal test positivity were found 32.5% and 67.9% respectively in confirmed cases. *Salmonella typhi* (94.7%) was the most common among 38 culture-positive isolates. MDR was found in 18.1% of isolates. Ceftriaxone, Cefepime, Meropenem and Ofloxacin had significant (>80%) sensitivity while decreased sensitivity was observed with Azithromycin and some fluoroquinolones. Complications developed in 35% patients, primarily urinary tract infection and pneumonia. **Conclusion:** Enteric fever remains a significant cause of childhood hospitalization. Although there are Multi Drug Resistant (MDR) strains of *S. typhi*, more widely resistant to commonly used cephalosporins was observed. Anti-Microbial Resistance (AMR) surveillance, rational antibiotic usage and improvement of water/sanitation are immense need for controlling Enteric fever.

Keywords: Enteric fever, typhoid, children, antibiotic sensitivity, *Salmonella typhi*, Bangladesh.

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Introduction

Despite significant development, there has been no reduction of this enteric fever burden in many developing countries like Bangladesh. Childhood morbidity attributable to typhoid and paratyphoid fever remains significant despite the development of newer antibacterial agents. Population based studies in South Asia suggest that a significant burden of typhoid infections is experienced among young children, including those less than five years old. The estimated incidence of typhoid fever varies widely (about 100–1,000 cases per 100,000 population) in many low- to middle-income regions with most occurring in Asia and the remainder predominantly in Africa and Latin America [1-4].

Enteric fever is caused mostly due to S enterica serovar typhi and S. enterica serovar paratyphi A and B and is transmitted feco–orally. The disease is closely linked to poverty and has been attributed to drinking unsafe water, poor sanitation and insufficient hygiene; humans are the only natural host and reservoir [5, 6]. The presentation in children may be varying and largely age dependent. It can present as septicemia in newborns, diarrheal illness in infants or respiratory and systemic symptoms in the older children [6]. Additionally, unusual complications as splenic or liver abscess, meningitis, cholecystitis and osteomyelitis, peritonitis and nervous system presentations even psychosis have been described [7, 8]. These varying and sometimes atypical symptoms mean that enteric fever in children may be diagnosed late or not detected at all. In addition, currently available typhoid vaccines have restricted suitability for very young children and are not licensed for use in children under 2 years of age in most instances [8, 9].

Antibiotics remain the foundation of enteric fever treatment as without treatment infection increase the chances of prolonged courses of morbidity, complications, and chronic carrier status. But treatment options have been complicated nowadays due to antimicrobial resistance. During the 1990s, strains of multidrug-resistant S. typhi have been reported more frequently (resistant to chloramphenicol, ampicillin and cotrimoxazole). Fluoroquinolones were previously highly effective; however decreased susceptibility and treatment failure has begun to appear in multiple regions [10, 11]. Third-generation cephalosporins are commonly used todays but resistant cases have also been reported [12, 13]. Azithromycin has more recently been evaluated as an oral option for uncomplicated infections and has demonstrated a reduction in clinical success compared with fluoroquinolones, and increase in relapse when compared with ceftriaxone for multidrug resistant organisms [14].

Based on the changing clinical presentations and resistance patterns, local evidence is required on a regular basis to facilitate timely diagnosis and selection of appropriate antibiotic therapy [15]. Hence, the present study is designed to describe clinical patterns of childhood enteric fever and also antibiotic resistance pattern among pediatric patients suffering from enteric fever admitted in a tertiary care hospital at Satkhira, Bangladesh.

The present study includes 50 cases of colorectal adenocarcinomas reported in the Department of Pathology, Rajshahi Medical College. The age group ranged from 20-75 years with a mean age 51.2±13.74. Most 13 (26%) cases belonged to the age group of 51-60 years. 3 (6%) cases were less than 30 years, 10 (20%) cases were within 31-40 years, 12 (24%) cases were within 41-50 years and 12 (24%) were in the age group of more than 60 years. Table-1 shows the age wise distribution of colorectal adenocarcinomas in our study.

Objectives

General Objective

- To assess the clinical profile of pediatric enteric fever and determine the antibiotic sensitivity pattern of the disease in this region.

Specific Objectives

- To identify and describe the complications associated with enteric fever among hospitalized children.
- To determine the antibiotic sensitivity patterns of Salmonella enterica isolates causing enteric fever.

Methodology

This was a prospective observational study conducted to evaluate the clinical profile and antibiotic sensitivity pattern of enteric fever among hospitalized children. The study was carried out in the Pediatric Inpatient Department of Satkhira Medical College Hospital, a tertiary care referral hospital Satkhira, Bangladesh. The study was conducted over a one-year period from October 2023 to September 2024. Children aged up to 14 years admitted with clinical suspicion of enteric fever during the study period constituted the study population. A total of 147 children were clinically diagnosed as having enteric fever. Among them, 81 children were laboratory confirmed by blood culture and/or significant Widal test and were included in the final analysis. A child presenting with fever ≥100.4°F for at least three consecutive days, along with gastrointestinal symptoms such as abdominal pain, vomiting, diarrhea, or constipation, in an endemic setting like Bangladesh was considered a suspected case of enteric fever [16]. Children were included in the study if they fulfilled any one of the following criteria: (1) Positive blood culture for Salmonella enterica (Typhi or Paratyphi), or (2) Significant Widal test result defined as a TO titre ≥1:160. A purposive sampling technique was adopted. All eligible children meeting the inclusion criteria during the study period were consecutively enrolled. Information was recorded using a standardized and pretested data collection form. Data were recorded including age, gender, clinical symptoms and examination findings at presentation, duration with fever, laboratory investigations carried out and treatment provided. Blood was taken for culture and sensitivity testing and Widal test from all suspected cases of enteric fever. Standard microbiologic methods were used to process all blood cultures for isolation and identification of Salmonella enterica serovars [17]. Antibiotic sensitivity tests were carried out by disc diffusion method and interpreted according to Clinical and Laboratory Standards Institute (CLSI). Statistical analysis was done using SPSS version 20. Demographic and clinical characteristics were presented using descriptive statistics. The relationships between variables were examined by Chi-square test and Mann–Whitney U test as appropriate. A p-value of <0.05 was taken as a statistical significance. Informed consents were taken from patient's parents and ethical clearance was taken from the ethical review committee of Satkhira Medical College Hospital, Satkhira, Bangladesh.

Results

There were 81 total laboratory confirmed cases of pediatric enteric fever in the analysis. Children > 5 years accounted for the majority patients (70.4%), and suggests that school-aged children were most affected by the condition. Children aged 5–<10 years comprised the largest sub-group, followed by those ≥ 10 years. In contrast, the percentage of infants and toddlers less than 2 years old was also relatively small (7.4%), indicating a lower incidence in early childhood. Sex analysis revealed a male preponderance in most age groups. In total, there were 46 (56.8%) boys and 35 (43.2%) girls in this study, with a male-to-female ratio of approximately 1.3:1. The predominance of male cases may be

attributed to more frequent ingestion of contaminated food and water, more outdoor activities, or gender-related differences in using of health care services. (Table:1). Children with enteric fever presented at hospitalization with various systemic and gastrointestinal signs. Tachycardia was the most common clinical manifestation with 93.8% of patients having it, representing the acute systemic response to infection. Pallor (low) were observed in 74.1%, pointing to a high frequency of anemia or chronicity of the illness. Sixty-five-point four percentage children had coated tongue, which was one of the classical features of enteric fever. Physical examination of the abdomen disclosed hepatomegaly in 42.0% and hepatosplenomegaly in 4.9%. Of note, no patient had isolated splenomegaly and over half (53.1%) had no organomegaly at diagnosis. Additionally, toxicity (23.5%), obtundation (17.3%), caecal gurgling (6.2%) were present in fewer patients; none of the patient had relative bradycardia. In summary, the clinical findings emphasize a systemic illness with varying abdominal symptoms in children with enteric fever (Table:2). Risk factors for enteric fever were determined and children who received diagnosis of enteric fever demonstrated statistically significant association among the diagnosis positivity of test, age and duration with which the child first presented with fever. Most cases were detected either by positive (significant) Widal test alone (67.9% patients) or only Gram-Negative-Bacteria (GNB) in the blood culture (9.9%). The rest of 22.2% cases were positivity on both blood culture and Widal test. Age-stratified analysis revealed that the proportion of subjects with evidence of positive blood culture was higher in younger children especially for those aged <2 years; while Widal test positivity showed a decreasing trend with on-coming age. This correlation between age group and imaging modality was significant (Table: 3).

When the details were examined on the basis of duration of fever, blood culture positivity was seen significant among those who reported within 3 to 7 days after onset of illness, whereas Widal Positivity exceeded after first week of fever. In the current study, maximum Widal-positive cases were reported among febrile children who suffered from 8–14 days which further indicate an increase in antibody titer after certain number of days. There was a significant association between duration of fever and findings of investigations, indicating the need for blood culture and Widal test at different duration of enteric fever sufferings (Table: 4 A and B).

Blood culture positivity was observed in 26 patients; however, a total of 38 Salmonella enterica isolates were available for antimicrobial susceptibility testing. Most 94.7%) of the isolates were Salmonella Typhi, 5.3% were S Paratyphi A. Sensitivity testing to 16 commonly used antibiotics provided important data for clinical application. The investigation showed high in-vitro sensitivity (above 80%) to third-generation cephalosporins such as Ceftriaxone, Cefepime and Meropenem. Moderate sensitivity was noted among fluoroquinolones; Ciprofloxacin was effective in 72.2% of S. Typhi and 50% of S. Paratyphi (A) whereas Levofloxacin had low sensitivity (52.8%) indicating rising resistance within this class drugs. Caliber of the former first line drugs; Ampicillin (16.7%), Chloramphenicol (27.8%) displayed very low sensitivity. Azithromycin showed poor sensitivity (22.2%) and surprisingly Cefixime was found 100% resistant to all culture proven cases. In general, 18.1% of them were multidrug resistant showing that MDR strains are still there. These results highlight the need for regular antimicrobial monitoring and judicious antibiotic prescribing in the management of pediatric enteric fever (Table: 5).

Fever and anorexia were universal symptoms,

while abdominal pain and gastrointestinal symptoms were common clinically. The lack of a step-ladder fever distribution supports previous evidence that it is relatively infrequent in children. Signs Tachycardia, Pallor: Signs of systemic illness. Hepatomegaly was more frequently detected than splenomegaly, and over half the children had no organ splenomegaly, which highlights one difference between this study and some previous reports but is consistent with studies that have highlighted heterogeneity of abdominal examination in pediatric enteric fever (Fig:1). Complications were found in 31 cases (38.3%) and 11 patients suffered from one or more complications. The most frequent complications were Urinary Tract infection (UTI) 15 cases (46.5%) and Bronchopneumonia 12 cases (38.7%). Serious complications were rare and included Hepatitis 2 cases (6.5%), Cholecystitis 1 case (3.2%), Peritonitis ,1 case (3.2%) and Encephalopathy ,1 case (3.2%) (Figure: 2).

Table I. Distribution of the Children by Age and Sex (n = 81).

Age group (years)	Male	Female	Frequency n (%)
< 2	2	4	6 (7.4)
2 – <5	10	8	18 (22.2)
5 – <10	21	16	37 (45.7)
≥ 10	13	7	20 (24.7)
Total	46	35	81 (100)

Table II. Signs at Presentation (n = 81).

Clinical sign	Frequency n (%)
Tachycardia	76 (93.8)
Pallor	60 (74.1)
Coated tongue	53 (65.4)
Hepatomegaly	34 (42)
Hepatosplenomegaly	4 (4.9)
No organomegaly	43 (53.1)
Splenomegaly	0 (0)
Relative bradycardia	0 (0)
Caecal gurgling	5 (6.2)
Toxicity	19 (23.5)
Obtundation	14 (17.3)

Table III. Age-Stratified Distribution of Diagnostic Test Positivity in Children with Enteric Fever (n = 81).

Age group (years)	Blood culture positive n (%)	Widal test positive n (%)	Total
< 2	5 (62.5)	3 (37.5)	8
2 – <5	9 (33.3)	18 (66.7)	27
5 – <10	16 (27.6)	42 (72.4)	58
≥ 10	7 (29.2)	17 (70.8)	24
Total	37 (31.6)	80 (68.4)	117

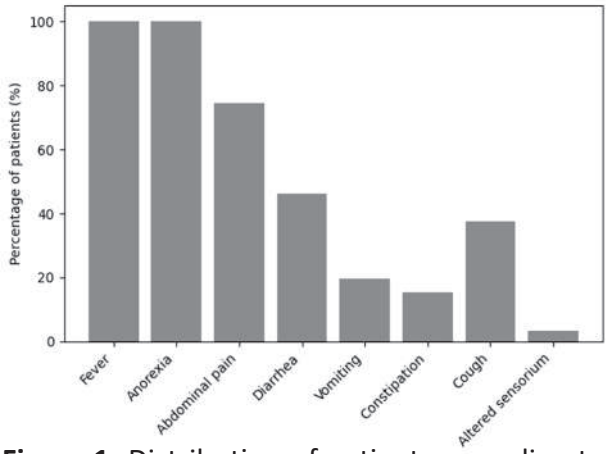

Figure 1: Distribution of patients according to presenting symptoms.

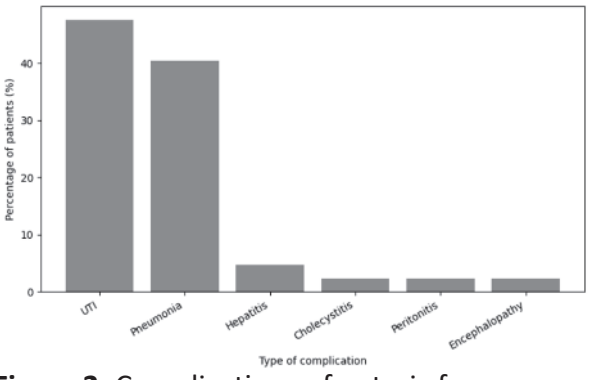

Figure 2: Complications of enteric fever.

Table IV (a). Association between Investigations, Age Group, and Duration of Fever (distribution by age group).

Age group (years)	**Only Widal positive** n (%)	**Only blood culture positive** n (%)	**Both positive** n (%)	**Total** n (%)
< 2	1 (16.7)	3 (50.0)	2 (33.3)	6 (100)
2 – <5	12 (66.7)	3 (16.7)	3 (16.7)	18 (100)
5 – <10	27 (73.0)	2 (5.4)	8 (21.6)	37 (100)
≥ 10	15 (75.0)	0 (0.0)	5 (25.0)	20 (100)
Total	55 (67.9)	8 (9.9)	18 (22.2)	81 (100)

Table IV (b). Association between Investigations, Age Group, and Duration of Fever (duration of fever at presentation).

Duration of fever	**Only Widal positive** n (%)	**Only blood culture positive** n (%)	**Both positive** n (%)	**Total** n (%)
3 – 7 days	5 (27.8)	7 (38.9)	6 (33.3)	18 (100)
8 – 14 days	47 (83.9)	1 (1.8)	8 (14.3)	56 (100)
> 14 days	3 (42.9)	0 (0.0)	4 (57.1)	7 (100)
Total	55 (67.9)	8 (9.9)	18 (22.2)	81 (100)

Table V. Sensitivity Patterns of S*almonella enterica* Isolates.

Antibiotic	***S. Typhi*** (n = 36), n/N (%)	***S. Paratyphi A*** (n = 2), n/N (%)
Amoxiclav	13/36 (35.0)	0/2 (0.0)
Amoxicillin	10/36 (27.8)	0/2 (0.0)
Ampicillin	6/36 (16.7)	0/2 (0.0)
Chloramphenicol	10/36 (27.8)	0/2 (0.0)
Cotrimoxazole	14/36 (38.9)	0/2 (0.0)
Azithromycin	8/36 (22.2)	2/2 (100.0)
Cefixime	0/36 (0.0)	0/2 (0.0)
Ceftriaxone	30/36 (83.3)	2/2 (100.0)
Ceftazidime	18/36 (50.0)	1/2 (50.0)
Cefepime	31/36 (86.1)	2/2 (100.0)
Meropenem	36/36 (100.2)	2/2 (100.0)
Ciprofloxacin	26/36 (72.2)	1/2 (50.0)
Levofloxacin	19/36 (52.8)	0/2 (0.0)
Ofloxacin	36/36 (100.0)	2/2 (100.0)
Nalidixic acid	0/36 (0.0)	0/2 (0.0)
Gentamicin	14/36 (38.9)	0/2 (0.0)

Discussion

This prospective observational study provides updated evidence on the clinical profile, diagnostic characteristics, complications, and antimicrobial susceptibility patterns of pediatric enteric fever in a tertiary care hospital in Satkhira. The findings confirm that enteric fever continues to be a significant cause of hospitalization among children in Bangladesh and highlight important shifts in antibiotic sensitivity patterns that have direct implications for effective and successful management.

In this present study, enteric fever predominantly affected school-aged children, with approximately 70% of confirmed cases occurring in children aged 5 years or older. This age distribution is consistent with previous studies from endemic regions and may be attributed

to increased exposure to contaminated food and water, school attendance, and greater outdoor activity among older children. A male predominance (male: female ratio = 1.3:1) was observed, which has also been reported in earlier studies and may reflect gender-related differences in exposure or healthcare-seeking behavior [9].

Clinically, fever and anorexia were universal symptoms, while abdominal pain and gastrointestinal manifestations were common. Classical feature such as step-ladder pattern fever was not observed, supporting recent evidence that such patterns are uncommon in pediatric enteric fever [7]. On physical examination, tachycardia and pallor were the most frequent findings, indicating systemic illness. Hepatomegaly was more commonly observed than splenic enlargement, and more than half of the patients had no organomegaly, a finding that differs from older literature but aligns with more recent pediatric studies showing variable abdominal signs [8].

Diagnostic analysis revealed that blood culture positivity was higher in younger children, particularly those under 2 years of age, whereas Widal test positivity increased with advancing age and longer duration of fever. Blood culture positivity was highest among children presenting within the first week of illness, while Widal test positivity predominated after 8–14 days of fever. This time-dependent diagnostic yield underscores the complementary role of blood culture and serological testing in endemic settings, especially where prior antibiotic use may reduce culture positivity.

A major strength of this study is the detailed evaluation of antibiotic sensitivity patterns. Among the Salmonella enterica isolates, Salmonella typhi was the predominant organism, with a small proportion of Salmonella paratyphi A. The study demonstrated markedly reduced sensitivity to commonly used oral antibiotics, including Amoxiclav (35%) and Azithromycin (22.2%), indicating limited effectiveness of these agents. Alarmingly, cefixime showed complete resistance (0% sensitivity), suggesting that its empirical use may no longer be appropriate in this setting.

In contrast, Ceftriaxone (84%), Meropenem (100%) and Ofloxacin (100%) retained relatively high effectiveness and remain reliable option for hospitalized pediatric enteric fever cases. The presence of reduced sensitivity to multiple oral agents and complete resistance to cefixime highlights the growing challenge of antimicrobial resistance. Although multidrug-resistant strains persist, the retained efficacy of ceftriaxone suggests that resistance to key parenteral cephalosporins has not yet reached critical levels.

Complications were observed in more than one-third of patients, with urinary tract infection and pneumonia being the most common. Severe complications such as hepatitis, cholecystitis, peritonitis, and encephalopathy were uncommon, and no mortality was recorded, likely reflecting timely diagnosis and appropriate antimicrobial therapy.

Overall, this study emphasizes the continued burden of pediatric enteric fever in Bangladesh and underscores the urgent need for regular AMR surveillance, culture-guided antibiotic therapy, and judicious prescribing practice of Antibiotics. Strengthening water safety, sanitation, and public health awareness remain paramount to reduce disease burden and prevent further escalation of drug-resistant enteric fever.

Conclusion

Enteric fever is still an endemic disease with considerable burden in hospitalized children in Bangladesh. The diagnostic yield was directly related to the duration of illness; though blood culture is still gold standard, positivity waned

because of earlier antibiotic use, whereas Widal test yielded significantly positive results in this endemic region. The majority of isolates were *Salmonella typhi*; the prevalence of MDR strains was found to be comparatively lower than that reported from some other geographical regions. Ceftriaxone, Meropenem, and Ofloxacin remained highly active in vitro; on the other hand Cefixime and Azithromycin showed reduced susceptibility, necessitating cautious choice of antibiotics. Taken together, the results underscore the importance of continued efforts to enhance water safety and sanitation, promote judicious use of antibiotics based on local sensitivity patterns, and monitor AMR while managing pediatric enteric fever effectively.

Conflict of interest: none.

References

1. Mogasale V, Maskery B, Ochiai RL, et al. Burden of typhoid fever in low-income and middle-income countries: a systematic, literature-based update with risk-factor adjustment. Lancet Glob Health. 2014;2(10):e570–e580.

2. Antillón M, Warren JL, Crawford FW, et al. The burden of typhoid fever in low- and middle-income countries: a meta-regression approach. PLoS Negl Trop Dis. 2017;11(2):e0005376.

3. Piovani D, et al. The global burden of enteric fever, 2017–2021: a systematic analysis for the Global Burden of Disease Study. eClinicalMedicine. 2024.

4. Liu G, et al. The global burden of typhoid and paratyphoid fever from 1990 to 2021 and the impact on prevention and control. BMC Infect Dis. 2025.

5. World Health Organization. Typhoid and other invasive salmonellosis. https://www.who.int/news-room/fact-sheets/detail/typhoid

6. Centers for Disease Control and Prevention. Typhoid and paratyphoid fever. CDC. https://www.cdc.gov/typhoid-fever/index.html

7. Britto C, Pollard AJ, Voysey M, Blohmke CJ. An appraisal of the clinical features of pediatric enteric fever. Clin Infect Dis. 2017;64(6):792–801.

8. Siddiqui FJ, Rabbani F, Hasan R, Nizami SQ, Bhutta ZA. Typhoid fever in children: epidemiological and clinical features. Int J Infect Dis. 2006;10(3):215–222.

9. Hancuh M, et al. Typhoid fever surveillance, incidence estimates, and trends — global disease burden. MMWR. 2023.

10. World Health Organization. Typhoid: fact sheet.https://www.who.int/news-room/-fact-sheets/detail/typhoid

11. Tanmoy AM, et al. Trends in antimicrobial resistance among Salmonella Typhi in Bangladesh, 1999–2022. PLoS Negl Trop Dis. 2024.

12. Thirumoorthy TP, et al. Azithromycin resistance in Salmonella Typhi: MIC and disc diffusion study. JAC-Antimicrob Resist. 2025;7(4).

13. Hooda Y, et al. Emergence of ceftriaxone-resistant Salmonella Typhi in Bangladesh. bioRxiv. 2024 (preprint).

14. Trivedi NA, Shah PC. Meta-analysis comparing azithromycin with fluoroquinolones and cephalosporins in enteric fever. J Postgrad Med. 2012;58(2):112–118.

15. World Health Organization. Antimicrobial resistance in Salmonella. https://www.who.int/teams/global-antimicrobial-resistance-surveillance-system

16. Dahiya S, et al. Ceftriaxone-resistant Salmonella Typhi isolates: resistance profile and genomic features. J Infect Public Health. 2023.

17. Kim CL, et al. The burden of typhoid fever in sub-Saharan Africa. Ther Adv Infect Dis. 2022.

Original Article

Socioeconomic and Cultural Determinants of Teenage Pregnancy in a District Hospital

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Abstract

Background: Teenage pregnancy remains a pressing global public health issue, particularly in low- and middle-income countries, where it is associated with adverse maternal, neonatal, and social outcomes. Socioeconomic and cultural factors significantly influence adolescent vulnerability to early pregnancy. **Aim of the study:** To identify and analyze the socioeconomic and cultural determinants contributing to teenage pregnancy among adolescent females attending a district hospital. **Methods:** A cross-sectional study was conducted among 120 adolescent females aged 13–19 years, either currently pregnant or postpartum within one year, at Department of Obstetrics & Gynaecology, Satkhira Medical College, Satkhira, Bangladesh. Data were collected using a structured, interviewer-administered questionnaire capturing socio-demographic, cultural, and family-related variables. Bivariate and multivariable logistic regression analyses were performed to identify independent predictors of teenage pregnancy. **Result:** The mean age of participants was 16.9 ± 1.2 years. Among adolescents, 29.2% had no formal education, 58.3% were married, and 58.3% lived in extended families. Bivariate analysis identified low education, low family income, extended family structure, limited media exposure, cultural beliefs favoring early marriage, religious restrictions, and elder influence as significant factors. Multivariable logistic regression revealed that lack of formal education (AOR 3.6; 95% CI: 1.30–9.95; p = 0.014), absence of media exposure on reproductive health (AOR 2.25; 95% CI: 1.10–4.60; p = 0.025), and cultural beliefs supporting early marriage (AOR 2.85; 95% CI: 1.28–6.32; p = 0.01) were independent predictors of teenage pregnancy. **Conclusion:** Teenage pregnancy in this population is strongly influenced by educational disadvantage, limited access to reproductive health information, and sociocultural norms favoring early marriage. Interventions addressing these factors through education, media-based reproductive health promotion, and culturally sensitive community engagement are critical to reducing adolescent pregnancy and its associated social and health consequences.

Keywords: Teenage pregnancy, ocioeconomic determinants, cultural factors, adolescent reproductive health, district hospital, early marriage.

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Introduction

Teenage pregnancy is a major public health issue with significant implications for maternal, neonatal, and social outcomes, representing a critical challenge in both developed and developing countries [1]. Globally, it is estimated that nearly one in five adolescent girls experience pregnancy before the age of 19, reflecting a pooled prevalence of around 17.90%, and underscoring the magnitude of the problem on an international scale [2]. Teenage pregnancy is widely recognized not only for its association with adverse medical outcomes such as higher risks of obstetric complications, preterm birth, and neonatal morbidity, but also for its profound social consequences, including disrupted education, reduced employment opportunities, and perpetuation of intergenerational poverty [3]. The determinants of teenage pregnancy are deeply rooted in a complex interplay of socioeconomic and cultural factors that shape young women's exposure to risk and access to protective resources [4]. Low levels of education, economic deprivation, and limited access to reproductive health information and services are consistently identified as strong predictors of adolescent childbearing, as these conditions diminish young women's ability to make informed decisions and exercise autonomy over their reproductive lives [5]. Cultural influences, such as early marriage, gender norms that promote subordination of women, inadequate parental guidance, and social taboos surrounding discussions of sexuality, further compound vulnerability by limiting awareness, discouraging contraceptive use, and normalizing adolescent fertility within certain communities [6]. Moreover, peer influences, media exposure, and broader societal expectations about femininity and motherhood create additional layers of pressure that contribute to early sexual activity and unintended pregnancies [7]. The intersection of these determinants results in a cycle where socioeconomic disadvantage increases susceptibility to pregnancy, and pregnancy in turn exacerbates social and economic marginalization [8]. This reciprocal relationship highlights the urgent need to examine teenage pregnancy beyond its biomedical dimensions, situating it within the broader social determinants of health framework [9]. District hospitals, which serve as primary referral centers for large catchment populations, provide a unique lens to study these dynamics, as they receive adolescents from diverse backgrounds, reflecting variations in income, education, cultural traditions, and health-seeking behavior [10]. Understanding the socioeconomic and cultural determinants of teenage pregnancy at this level is essential for designing context-specific interventions that address not only the immediate clinical needs of pregnant adolescents but also the upstream factors that drive early conception. Such an approach aligns with global commitments to reducing adolescent fertility rates, improving maternal and child health outcomes, and achieving the Sustainable Development Goals, particularly those related to gender equality, education, and poverty reduction [11]. Research in district hospitals can reveal how social inequalities and cultural norms shape teenage pregnancy, providing evidence to guide prevention, improve reproductive health services, and support policies that empower adolescents to delay pregnancy. The aim of this study is to identify and analyze the socioeconomic and cultural determinants contributing to teenage pregnancy among patients attending a district hospital, with the goal of understanding underlying risk factors and informing targeted interventions to reduce its prevalence and adverse outcomes.

Methods

A cross-sectional study was conducted at

[Department of Obstetrics & Gynaecology, Satkhira Medical College, Satkhira, Bangladesh, a tertiary care center serving both urban and rural populations, between July 2024 to June 2025. The study was approved by the Written informed consent was obtained from all participants; for minors, consent was additionally obtained from a parent or guardian. Confidentiality and anonymity were strictly maintained throughout the study.

Study Population

The study population comprised adolescent females aged 13–19 years who attended the hospital during the study period. A total of 120 participants were recruited using a consecutive sampling approach. Inclusion criteria included those who were currently pregnant or had delivered within the past six months. Exclusion criteria were adolescents with severe medical or psychiatric conditions that could impair participation, and those unwilling to provide informed consent.

Data Collection

Data were collected using a structured, interviewer-administered questionnaire designed specifically for this study. The questionnaire was developed after reviewing relevant literature on socioeconomic and cultural determinants of teenage pregnancy and was tailored to the local context. It captured information on socio-demographic characteristics such as age, educational status, occupation, marital status, and family income, as well as cultural and family-related factors including family structure, parental education, exposure to mass media, cultural beliefs supporting early marriage, community acceptance of teenage pregnancy, religious or cultural restrictions on contraception, and the influence of elders on marriage decisions. Prior to the main study, the questionnaire was pretested on 10% of the target population in a similar setting to ensure clarity, relevance, and cultural appropriateness. Data were collected by trained research assistants through face-to-face interviews, and completed questionnaires were checked daily by the principal investigator for completeness and consistency.

Statistical Analysis

Data were entered into SPSS version 26 for analysis. Descriptive statistics were used to summarize baseline socio-demographic and cultural characteristics. Continuous variables were presented as mean ± standard deviation (SD) or median with interquartile range (IQR), depending on normality, while categorical variables were presented as frequencies and percentages. Bivariate analysis using chi-square tests and crude odds ratios (ORs) with 95% confidence intervals (CIs) was performed to identify factors associated with teenage pregnancy. Variables with $p < 0.20$ in bivariate analysis were entered into a multivariable logistic regression model to adjust for potential confounders. Adjusted odds ratios (AORs) with 95% CIs and p-values were reported. Statistical significance was set at $p < 0.05$.

Results

Table 1 summarizes the socio-demographic profile of the 120 participants in this study. The mean age was 16.9±1.2 years, indicating that most adolescents were in the late teenage years. Educational attainment varied considerably: 29.2% had no formal education, 37.5% completed primary school, and 33.3% achieved secondary education or higher. Regarding occupation, 40% were students, 31.7% engaged in housemaid work or informal labor, and 28.3% were involved in small trade or were unemployed. Marital status data revealed that 58.3% were married, reflecting a high prevalence of early marriage, while 41.7% remained unmarried. Family income analysis showed a median monthly income of 90 USD (IQR 65–115), suggesting that most households fell within low- to middle-income ranges.

These characteristics highlight that teenage pregnancy occurs across diverse educational backgrounds, modest income levels, and in a context where early marriage is common. Table 2 presents cultural and family-related factors. Most participants (58.3%) came from extended families, with low parental education: 38.3% of fathers and 43.3% of mothers had no formal schooling, while only 26.7% of fathers and 23.3% of mothers had secondary education or higher. Exposure to mass media on reproductive health was limited (41.7%), and cultural beliefs supporting early marriage were reported by 35%. Community acceptance of teenage pregnancy varied, with 25% reporting high acceptance and 41.7% low. Nearly half (45.8%) faced religious or cultural restrictions on contraception, and family influence on marriage decisions remained significant, affecting 40% of adolescents. Bivariate analysis in Table 3 identified several factors associated with teenage pregnancy, including lower education, low income, extended family structure, lack of reproductive health information, cultural beliefs favoring early marriage, religious restrictions, and family influence. Table 4's adjusted model confirmed that no formal education (AOR 3.6, p = 0.014), lack of mass media exposure (AOR 2.25, p = 0.025), and cultural beliefs supporting early marriage (AOR 2.85, p = 0.01) were independent predictors. Other factors, though elevated, did not reach statistical significance. Overall, these findings underscore that teenage pregnancy in this population is shaped by educational disadvantage, limited access to reproductive health information, and sociocultural norms favoring early marriage, highlighting the interplay of social, economic, and cultural determinants.

Table I: Baseline socio-demographic characteristics of the study population (N = 120).

Variable	Frequency (n)	Percentage (%)
Age (years)		
Mean ± SD	16.9 ± 1.2	
Educational Status		
No formal education	35 (29.17)	29.17
Primary	45 (37.5)	37.50
Secondary and above	40 (33.3)	33.33
Occupation		
Student	48 (40)	40.00
Housemaid/Informal labor	38 (31.67)	31.67
Others (small trade, unemployed)	34 (28.33)	28.33
Marital Status		
Married	70 (58.33)	58.33
Unmarried	50 (41.67)	41.67
Family Monthly Income		
Median (IQR, USD)	90 (65–115)	

Table II: Cultural and family-related characteristics of teenage mothers.

Variable	Frequency (n)	Percentage (%)
Family Structure		
Nuclear	50 (41.7)	41.70
Extended	70 (58.3)	58.30
Father's Education		
No formal education	46 (38.33)	38.33
Primary	42 (35)	35.00
Secondary and above	32 (26.67)	26.67
Mother's Education		
No formal education	52 (43.33)	43.33
Primary	40 (33.33)	33.33
Secondary and above	28 (23.33)	23.33
Exposure to Mass Media (Reproductive Health Information)		
Yes	50 (41.67)	41.67
No	70 (58.33)	58.33
Cultural Belief Supporting Early Marriage		
Yes	42 (35)	35.00
No	78 (65)	65.00
Community Acceptance of Teenage Pregnancy		
High	30 (25)	25.00
Moderate	40 (33.33)	33.33
Low	50 (41.67)	41.67
Religious/Cultural Restrictions on Contraception		
Yes	55 (45.83)	45.83
No	65 (54.17)	54.17
Influence of Elders/Family on Marriage Decisions		
High	48 (40)	40.00
Low	72 (60)	60.00

Table III: Socioeconomic and cultural determinants associated with teenage pregnancy (Bivariate Analysis).

Variable	Category	Teenage Pregnancy (%)	Crude OR (95% CI)	p-value
Educational Status	No formal education	68.57	5.09 (1.91–13.56)	0.002
	Primary	53.33	2.66 (1.00–7.08)	0.05
	Secondary and above	30.00	Reference	—
Family Income	Low (<100 USD)	62.50	2.33 (1.11–4.89)	0.025
Family Structure	Extended	60.00	2.67 (1.32–5.38)	0.006
Exposure to Mass Media	No	64.29	2.49 (1.28–4.86)	0.007
Cultural Belief Supporting Early Marriage	Yes	71.43	2.92 (1.37–6.21)	0.005
Community Acceptance of Teenage Pregnancy	High	66.67	2.17 (0.93–5.08)	0.072
Religious Restrictions on Contraception	Yes	65.45	2.36 (1.11–5.01)	0.025
Influence of Elders on Marriage	High	63.00	2.09 (1.01–4.32)	0.047

Table IV: Multivariable logistic regression model for determinants of teenage pregnancy.

Determinant	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
No Formal Education (vs Secondary & above)	3.6	1.30–9.95	0.014
Primary Education (vs Secondary & above)	1.9	0.70–5.15	0.206
Low Family Income (<100 USD)	2.1	0.95–4.63	0.066
Extended Family Structure	2	0.95–4.22	0.068
No Media Exposure	2.25	1.10–4.60	0.025
Cultural Belief Supporting Early Marriage	2.85	1.28–6.32	0.01
Religious Restrictions on Contraception	1.95	0.90–4.21	0.089
Influence of Elders on Marriage	1.85	0.88–3.88	0.101

Discussion

Teenage pregnancy remains a pressing global public health concern, particularly in low- and middle-income countries where structural inequalities and sociocultural norms intersect to heighten adolescent girls' vulnerability [12]. It is not only associated with adverse maternal and neonatal outcomes but also contributes to school dropout, reduced economic opportunities, and the perpetuation of intergenerational poverty [13]. Despite global progress in reducing early childbearing, regions such as South Asia and sub-Saharan Africa continue to report disproportionately high rates, reflecting persistent gaps in education, gender equity, and access to reproductive health services [14]. Against this background, the present study provides hospital-based evidence on the socioeconomic and cultural determinants of teenage pregnancy, highlighting the contextual drivers that sustain the problem in resource-constrained settings. In our study, lack of formal education was strongly associated with teenage pregnancy, with adolescents who had no schooling being nearly four times more likely to become pregnant compared to those with secondary or higher education. This finding aligns with studies from Uganda and Ethiopia, which consistently demonstrate that educational attainment delays marriage, improves reproductive health knowledge, and increases contraceptive uptake [15-16]. Conversely, low education restricts opportunities for empowerment, leaving girls vulnerable to cultural pressures for early marriage. Economic disadvantage also played a notable role. While low family income showed only borderline significance in adjusted models, the crude analysis revealed a clear association between poverty and adolescent pregnancy. Similar findings have been documented in Nigeria and Bangladesh, where poverty compels families to view early marriage as a means of economic relief [17-18]. Family structure emerged as another important determinant. Adolescents from extended families had higher odds of teenage pregnancy compared to those from nuclear families, though the association attenuated in multivariable analysis. Extended households may reinforce traditional norms that prioritize early marriage and motherhood, consistent with studies in sub-Saharan Africa where multigenerational living arrangements have been linked to stronger adherence to customary practices [19]. Moreover, low parental education observed among teenage mothers in our study mirrors evidence that parental literacy protects against adolescent pregnancy by supporting continued schooling and delaying marriage [20-21]. Limited exposure to reproductive health information was a significant predictor in the present study. Adolescents lacking access to mass media were over twice as likely to experience pregnancy, consistent with findings from Zambia, where limited media exposure increased the risk of adolescent pregnancy by reducing access to sexual and reproductive health information [22]. Similarly, studies in the Philippines reported that adolescents exposed to family planning messages via media channels had a lower likelihood of teenage pregnancy [23]. Evidence from the United States also indicates that media interventions, such as the MTV series 16 and Pregnant, contributed to measurable reductions in teen birth rates by promoting awareness and discussion of contraceptive methods [24]. Cultural and normative influences substantially reinforced the risk of teenage pregnancy in the present study. Specifically, cultural beliefs favoring early marriage were strongly associated with increased adolescent pregnancy. Similar findings from rural India and Nepal highlight how societal acceptance of early marriage sustains elevated adolescent pregnancy rates, despite existing legal prohibitions [25-26]. Although religious restrictions on contraception lost

significance in our study, faith-based norms still appeared influential in limiting contraceptive use, consistent with findings from northern Nigeria and South Asia, where religious values substantially shape reproductive behaviors and decision-making regarding family planning [27-28]. In our study, the influence of elders on marital decisions approached significance. Consistent with findings from patriarchal, collectivist contexts, elder family members frequently dictate marital timing and partner selection, constraining adolescent girls' autonomy [29].

Limitations of the study

This study was conducted in a single hospital setting, which may limit generalizability to adolescents in other regions or healthcare contexts. Data were self-reported, introducing potential recall and social desirability biases, particularly regarding sensitive topics such as sexual behavior and contraceptive use. Cultural nuances and community-level influences may not have been fully captured. Additionally, the cross-sectional design precludes causal inference, and unmeasured confounders could have influenced associations between socioeconomic, cultural factors, and teenage pregnancy.

Conclusion & Recommendations

Teenage pregnancy is strongly influenced by low education, limited access to reproductive health information, and cultural norms favoring early marriage. Adolescents lacking schooling or media exposure are at markedly higher risk, compounded by family and community pressures. Integrated interventions promoting education, culturally sensitive reproductive health awareness, and community engagement are essential to delay adolescent pregnancy, reduce associated maternal and neonatal risks, and empower young women to make informed reproductive choices.

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References

1. Jeha D, Usta I, Ghulmiyyah L, Nassar A. A review of the risks and consequences of adolescent pregnancy. Journal of neonatal-perinatal medicine. 2015 May 18;8(1):1-8.

2. Abate BB, Sendekie AK, Alamaw AW, Tegegne KM, Kitaw TA, Bizuayehu MA, Kassaw A, Yilak G, Zemariam AB, Tilahun BD. Prevalence, determinants, and complications of adolescent pregnancy: An umbrella review of systematic reviews and meta-analyses. AJOG Global Reports. 2025 Jan 20:100441.

3. Todhunter L, Hogan-Roy M, Pressman EK. Complications of pregnancy in adolescents. InSeminars in Reproductive Medicine 2022 Mar (Vol. 40, No. 01/02, pp. 098-106). Thieme Medical Publishers, Inc..

4. Yakubu I, Salisu WJ. Determinants of adolescent pregnancy in sub-Saharan Africa: a systematic review. Reproductive health. 2018 Jan 27;15(1):15.

5. Munakampe MN, Fwemba I, Zulu JM, Michelo C. Association between socioeconomic status and fertility among adolescents aged 15 to 19: an analysis of the 2013/2014 Zambia Demographic Health Survey (ZDHS). Reproductive health. 2021 Sep 10;18(1):182.\

6. Pacheco-Montoya D, Murphy-Graham E, López EE, Cohen AK. Gender norms, control over girls' sexuality, and child marriage: A Honduran case study. Journal of Adolescent Health. 2022 Mar 1;70(3):S22-7.

7. Villanti A, Boulay M, Juon HS. Peer, parent and media influences on adolescent smoking by developmental stage. Addictive behaviors. 2011 Jan 1;36(1-2):133-6.

8. Amjad S, Adesunkanmi M, Twynstra J, Seabrook JA, Ospina MB. Social determinants of health and adverse outcomes in adolescent pregnancies. InSeminars in reproductive medicine 2022 Mar (Vol. 40, No. 01/02, pp. 116-123). Thieme Medical Publishers, Inc..

9. Boutayeb A. Social determinants of health and adolescent childbearing in WHO Eastern Mediterranean countries. International Journal for Equity

in Health. 2023 May 2;22(1):78.
10. Chowdhury N, Rahim R, Khan LN, Sweety K, Akther P. Adolescent Pregnancy Outcome in a District Hospital of Bangladesh. Mugda Medical College Journal. 2022;5(2):55-9.
11. Alam N, Mollah MM, Naomi SS. Prevalence and determinants of adolescent childbearing: comparative analysis of 2017–18 and 2014 Bangladesh Demographic Health Survey. Frontiers in Public Health. 2023 Jun 19;11:1088465.
12. Huda MM, O'Flaherty M, Finlay JE, Al Mamun A. Time trends and sociodemographic inequalities in the prevalence of adolescent motherhood in 74 low-income and middle-income countries: a population-based study. The Lancet Child & Adolescent Health. 2021 Jan 1;5(1):26-36.
13. Yakubu I, Salisu WJ. Determinants of adolescent pregnancy in sub-Saharan Africa: a systematic review. Reproductive health. 2018 Jan 27;15(1):15.
14. Raj A, Salazar M, Jackson EC, Wyss N, McClendon KA, Khanna A, Belayneh Y, McDougal L. Students and brides: a qualitative analysis of the relationship between girls' education and early marriage in Ethiopia and India. BMC public health. 2019 Jan 7;19(1):19.
15. Ochen AM, Chi PC, Lawoko S. Predictors of teenage pregnancy among girls aged 13–19 years in Uganda: a community based case-control study. BMC pregnancy and childbirth. 2019 Jun 24;19(1):211.
16. Ayele BG, Gebregzabher TG, Hailu TT, Assefa BA. Determinants of teenage pregnancy in Degua Tembien District, Tigray, Northern Ethiopia: A community-based case-control study. PloS one. 2018 Jul 25;13(7):e0200898.
17. Nour NM. Child marriage: a silent health and human rights issue. Reviews in obstetrics and gynecology. 2009;2(1):51.
18. Chandra-Mouli V, Camacho AV, Michaud PA. WHO guidelines on preventing early pregnancy and poor reproductive outcomes among adolescents in developing countries. Journal of adolescent health. 2013 May 1;52(5):517-22.
19. Asmamaw DB, Tafere TZ, Negash WD. Prevalence of teenage pregnancy and its associated factors in high fertility sub-Saharan Africa countries: a multilevel analysis. BMC Women's Health. 2023 Jan 17;23(1):23.
20. Neal S, Matthews Z, Frost M, Fogstad H, Camacho AV, Laski L. Childbearing in adolescents aged 12–15 years in low resource countries: a neglected issue. New estimates from demographic and household surveys in 42 countries. Acta obstetricia et gynecologica Scandinavica. 2012 Sep;91(9):1114-8.
21. Gyan C. The effects of teenage pregnancy on the educational attainment of girls at Chorkor, a suburb of Accra. Journal of Educational and Social Research. 2013 Sep 3;3(3):53-60.
22. Sserwanja Q, Sepenu AS, Mwamba D, Mukunya D. Access to mass media and teenage pregnancy among adolescents in Zambia: a national cross-sectional survey. BMJ open. 2022 Jun 1;12(6):e052684.
23. Pepito VC, Amit AM, Tang CS, Co LM, Aliazas NA, De Los Reyes SJ, Baquiran RS, Tanchanco LB. Exposure to family planning messages and teenage pregnancy: results from the 2017 Philippine National Demographic and Health Survey. Reproductive Health. 2022 Dec 21;19(1):229.
24. Kearney MS, Levine PB. Media influences on social outcomes: The impact of MTV's 16 and pregnant on teen childbearing. American Economic Review. 2015 Dec 1;105(12):3597-632.
25. Shrestha S. Socio-cultural factors influencing adolescent pregnancy in rural Nepal. International journal of adolescent medicine and health. 2002 Apr;14(2):101-10.
26. Thapa P, Thapa P, Shrestha DB, Budhathoki P, Karki B, Mahat B. Teenage pregnancy and the sociodemographic attributes as a major contributor: Findings from an urban referral center in Nepal. World Journal of Obstetrics and Gynecology. 2021 Sep 30;10(2):16-25.
27. Usman HB. Contraceptive Use Among Northern Nigerian Women Ages 15 to 49 Years (Doctoral dissertation, Walden University).
28. Farid H, Siddique SM, Bachmann G, Janevic T, Pichika A. Practice of and attitudes towards family planning among South Asian American immigrants. Contraception. 2013 Oct 1;88(4):518-22.
29. Wado YD, Sully EA, Mumah JN. Pregnancy and early motherhood among adolescents in five East African countries: a multi-level analysis of risk and protective factors. BMC pregnancy and childbirth. 2019 Feb 6;19(1):59.

Original Article

A Study of Port Site Infections in Minimally Invasive Surgeries and Its Prevention and Management

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Abstract

Background: Port site infection in minimally invasive surgeries, including laparoscopic procedures, is a troublesome complication nowadays leading to increased patient morbidity and healthcare costs. It has corroded the advantages of minimal access surgery. Objectives: The study aimed to understand the cause of port site infection and how to manage the port site infection after minimally invasive/laparoscopic surgery. **Methods:** Twenty-eight patients who underwent laparoscopic surgeries and developed port site infection were included in the study from April, 2024 to October, 2025. Data regarding patient demographics, type of surgery, prior treatment and management of port site infections are recorded. The port site infections were divided into two groups. Early within first week of surgery and delayed after 4-6 weeks of surgery. Chronic wounds were classified into two types, tubercular mycobacterium TMs and non-tubercular mycobacterium NTMs. **Results:** In the present study the male to female ratio was 10:18(n=28). The mean age was 45.2 years, range 20-65 years. The index surgery was lap. Cholecystectomy (n=19), followed by lap. Appendicectomy (n=9). 07 patients had prior history of ATT intake out of which 05 patients had completed ATT before surgery. 09 patients were treated with excision of sinus tract and ATT. 07 patients were treated with oral antibiotics as per culture sensitivity. 12 Patients were treated with combination of Ciprofloxacin and Clarithromycin for 3 months for NTMs. All patients responded well to oral antibiotics and no patient had relapse or recurrent infection. **Conclusion:** Port site infections have corroded the advantages of minimal access surgery (MAS). Drug resistant mycobacteria are difficult to treat. Aggressive treatment with excision of sinus tract and oral antibiotics are effective. Sterilization should be improved, proper microbiological methods should be employed and utmost care of aseptic techniques in Operation Theatre is very important.

Keywords: Port site infection (PSI), Minimal access surgery, Tubercular mycobacterium (TMs), Non tubercular mycobacterium (NTMs), Ethylene oxide (ETO), Plasma sterilization, Minimal access surgery (MAS).

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Introduction

Minimal access surgeries/ laparoscopic surgeries have become the standard of care in current surgical practices [1, 2]. Laparoscopic techniques are now applied from simple procedures like laparoscopic cholecystectomy to more complex procedures like Whipple procedure [3, 4]. The advantages of minimal access techniques include, less pain, early ambulation, better cosmoses and early return to work and many more. But the laparoscopic surgeries are not immune to complications.

The port site infection (PSI) a troublesome complication after laparoscopic surgeries. It has been reported in 1.4 – 6.7% of the cases [5-8]. PSI soon erodes the advantages of laparoscopic techniques, with the patient becoming worried with the indolent and nagging infection and losing confidence on the operating surgeon. There occurs a significant increase in the morbidity, hospital stay and financial loss to the patient. The whole purpose of MAS to achieve utmost cosmoses is turned into an unsightly wound, and the quality of life of patients is seriously affected. The port site infections following laparoscopic surgeries can be early, which occur during 1 week of the procedure and delayed/chronic port site infections, which occur beyond 4-6 weeks of procedure [9]. Early port site infections are due to normal commensals and respond well to empirical antibiotics and wound care. Chronic port site infections due to non-tubercular mycobacterium (NTM) also called as atypical mycobacterium, are the troublesome as they evade the diagnosis and sterilization by routine techniques. Tubercular mycobacterium (TM) responds well to treatment. Secondly the heat insulation of laparoscopic instruments makes it further difficult for routine sterilization. Non tubercular mycobacterium NTM are drug resistant and causes relapses [10]. There are no clear-cut guidelines for port site infection management. Here we present our experience of management of port site infections in 28 patients following laparoscopic surgeries in our institution.

Methods

This prospective observational study was conducted in the Department of Surgery of Satkhira Medical College Hospital, Satkhira, Bangladesh for the period April, 2024 to October, 2025. Total 480 cases of laparoscopic surgery were done during this period. Total 28 cases were included in this study by purposive sampling as per inclusion criteria of patients with diagnosis of chronic cholecystitis and acute appendicitis who underwent laparoscopic cholecystectomy and laparoscopic appendicectomy and developed PSIs and exclusion criteria of patients taking steroids or immunosuppressant for long time, uncontrolled diabetes mellitus, appendicular abscess, appendicular perforation. Data includes patient demography, index surgery, any prior treatment before presentation, laboratory findings, antibiotic therapy and other treatment received in our hospital were recorded. Chronic port site infections were diagnosed on the basis of port site infection after 4-6 weeks of laparoscopic procedure, non-healing wound and persistent discharge. The chronic port site infections were classified according to the Chaudhuri et al findings [9] Table -1. Blood investigation especially haemogram, total proteins and serum albumin were done in all patients. All patients underwent USG for any collection and sinus tract. CT scan, MRI and sinogram were done as and when required. All patients with sinus tract were treated by complete excision of the tract. The sinus tract was then sent for culture and sensitivity including fungal, bacterial and mycobacterial cultures along with histopathological examination. The wounds which needed debridement only, again after debridement underwent culture for fungal, bacterial, and mycobacterium along with histopathology. All wounds after debridement were left open to heal by secondary intention and with negative pressure wound therapy. All patients received antibiotics as per culture sensitivity. SPSS -26 Version was used for analysis of data.

Results

In the present study, the age of the patients ranges between 20-65 years with mean age of 45.2 years. The male to female ratio was 10:18.

Index surgery

19 patients with PSIs had an index surgery of

Table I: Clinical staging of port site infections (Chaudhauri et al).

Clinical stage	Clinical features
Stage-I	Tender nodule in the vicinity of port site after 4 weeks
Stage-II	Nodule enlarges, becomes more tender and inflamed. A discharging sinus may appear.
Stage-III	Pus discharge and reduction in pain. Necrosis of overlying skin occurs.
Stage-IV	Chronic discharging sinus develops.
Stage –V	Darkening of surrounding skin. Multiple nodules may appear.

laparoscopic Cholecystectomy followed by laparoscopic Appendicectomy in 09 patients as shown in table-2.

Presentation and imaging findings

The Clinical presentation and radiological imaging revealed wound discharge followed by the sinus tract as the most common finding as shown in table-3.

Ports involved

The commonest ports involved in the present study were umbilical port followed by epigastric, other ports and multiple ports as shown in table-4.

Microbiology

The microbiological examination revealed atypical mycobacterium in most of the patients as shown in table-5.

Treatment received

09 patients who had port site infections due to mycobacterium tuberculosis MTs were treated with anti-tubercular therapy, 12 patients with port site infections due to atypical mycobacterium NMTs were treated with combination of ciprofloxacin and clarithromycin for 03 months and 07 patients were treated with amoxicillin, clavulanic acid and linzolid as per culture sensitivity as shown in table-6. All patients improved with oral antibiotic therapy and were asymptomatic on follow up. There was no relapse in any patient. Residual sinus tracts after completion of therapies as mention above were excised and also sent for histopathology.

Table II: Index surgeries in patients with PSIs.

Index Surgery	Frequency n (%)
Laparoscopic Cholecystectomy	19 (67.85)
Lap. Appendicectomy	09 (32.14)

Table III: Index surgeries in patients with PSIs.

Imaging	Frequency n (%)
Sinus tract	09 (32.14))
Wound discharge	11 (39.28)
Local collection	03 (10.71)
Chronic inflammation	05 (17.85)

Table IV: Port site involvement in patients with PSIs.

Port site	Frequency n (%)
Epigastric	07 (25)
Umbilical	12 (42.85)
Other ports	06 (21.42)
Multiple ports	03 (10.71)

Table V: Microbiological results in patients with PSIs.

Microbiology	Frequency n (%)
AFB (TB)	09 (32.14)
NMTS atypical mycobacterium	12 (42.85)
Other organisms	07 (25)

Table VI: Treatment received by patients with PSIs.

Diagnosis	Treatment	No. of patients
PSIs with Tuberculosis	ATT	09
PSIs with NTMs	Combination of Ciprofloxacin 500mg BD + Clarithromycin 500mg BD X 3 months	12
Others	Amoxicillin + clavulanic acid or Linezolid	07

Discussion

The surgical wounds are classified into 4 types such as clean, clean contaminated, contaminated and dirty wounds. Most of the wounds following laparoscopic surgeries fall in clean or contaminated category [11]. In one study the incidence of port site infection after laparoscopic procedures is 0.002 percent [12]. The overall incidence in the literature varies from 1.4-6.7% [13]. This varies from centre to centre depending upon the availability of sterilization methods, available instrument sets and patient load. In our set up with limited resource with high volume of patients it is around 1.6%. Predisposing factors for the development of port site infection after laparoscopic surgery are diabetic patients, patient on steroids, immune comprised, low nutrition, anaemic, CKD, pre-operative hospital stay of more than 2 days and prolonged operation duration (> 2 hours). The port site infections can be early within 4 weeks or delayed after 4-6 weeks of index surgery. It is the delayed port site infections which are worrying to the surgeon especially those caused by atypical mycobacteria NTMs because they are resistant to the conventional antibiotics. Once inoculated into the ports they grow slowly and rarely cause dissemination but grow locally. Woksinky [14] described that the two types of atypical mycobacterium, mycobacterium chelonae and mycobacterium fortuitum grow rapidly and colonize in water and soil and cause contamination anywhere. Reusable trocars are the main source of PSIs [15]. When the laparoscopic instruments are not cleaned properly, the blood, charred tissue gets collected in the joints of the laparoscopic instruments. Usage of such contaminated instruments are responsible for transmission of disease [16]. The PSIs can be exogeneous or endogenous. Endogenous source can be minimised by proper bowel preparation and by specimen retrieval in Endo bags. Exogenous source needs proper methods of sterilization. Laparoscopic instruments are heat labile and hence autoclave is not an option unlike the conventional instruments. Currently glutaraldehyde is used for the disinfection of the instruments. Glutaraldehyde in 2.0-2.5 percent with 20 minutes contact time is good disinfectant but not a good steriliser. As per current guidelines, the 3.5 percent solution of glutaraldehyde with a minimum exposure time of 8-12 hours has a desired level of sporicidal activity. The concentration of glutralde-

hyde solution, contact time and how often you change the solutions is important. As per guidelines, the solution should not be used for more than 100 cycles over 14 days (2.5 % glutraldehyde) or 28 days (3.4% glutraldehyde) [17]. Glutraldehyde of 3.4% with contact time of 8-12 hours has a sporicidal activity [18]. Finally after exposure to glutraldehyde, the laparoscopic instruments should be rinsed with sterile water. Glutraldehyde has numerous shortcomings. Orthophthaldehyde and pre acetic acid is a good alternative for high level disinfection with good efficacy. Plasma sterilization like STERRAD is less expensive and provides effective alternate for low temperature sterilization. Ethylene oxide (ETO) and formalin gas chambers are also an effective alternative but, their cast is the hinderence [9]. Sometimes these port sites may have persistent discharge due to some spilled stone or sometimes due to retained haemolock clips. The port site infections are complex but preventable [19]. They increase morbidity, reduce quality of life and may lead to confidence reduction in surgeon. To prevent / minimise port site infections, preventive measure should be taken into consideration by heart and soul. The pre-operative measures like preoperative antiseptic shower in the morning of surgery, new and ironed clothes after shower, trimming nails, high preoperative oxygen fraction, maintaining skin integrity. Preoperative skin preparation with 2% chlorhexidine gluconate or isopropyl alcohol reduces the catheter related blood born infections.[14] Proper sterilization protocol should be followed. Intra-operative precautions includes use of sterile drapes, gowns, gloves, proper handling of instruments, maintaining aseptic conditions, proper skin preparation, proper trocar size and placement to avoid nerve injury, wound protectors, maintain pneumoperitoneum sterility, minimize operative time, use of antimicrobial coatings, gentle tissue handling, proper closure technique, intraoperative irrigation of the surgical field, and education of staff and surgeon. Post operatively daily dressings, wound cleaning, drainage and debridement should be done and irrational antibiotics should be avoided.

Conclusion

Port site infections increase the morbidity and overshadow the benefits of minimal access surgery. Early port site infections due to normal skin flora respond well to antibiotics. Chronic port site infections are the troublesome as they are drug resistant. Better way to prevent these infections is to follow the standard methods of sterilization and take every measure to maintain the sterilization chain. Thorough microbiological methods should be employed to avoid the usage of empirical antibiotics.

References

1. Gumbs AA,Gayet B, Hoffman JP.Whipple procedure with a two lay ered pancreatojejunostomy. Surg Endosc.2011;25:3446-3447.

2. Peterson CY,Palazzi K, Parson JK, Chang DC,Ramamoorthy SL. The prevalence of laparoscopy and patient safety outcome: an analysis of colorectal resections. Surg Endosc.2014;28:608-616.

3. Cuschieri A,Dubois F,Mouiel J et al. The European experience with laparoscopic cholecystectomy. Am J Surg. 1991;1(161):385-387.

4. Rassweiler J,Frede T,Guillonneua B. Advanced laparoscopy. Eur Urol.2002; 42:1-12.

5. Shindholimath VV, Seenu V, Parsad R, Chaudhry R, Kumar A. factors influencing wound infection following laparoscopic cholecystectomy. Trop Gastr. 2003; 24:90-2.

6. Ravindranath GG, Reddy SVRM. Laparoscopic port site complications: a study in a tertiary care centre. International Surg J. 2016; 3(3):1121-4.

7. Kumar SS, Babu DK, Grace DR, Anpian JC, Bhaskar M. A study of port site infections in

laparoscopic surgeries. J Dent Med Sci. 2015; 14(4):20-2.
8. Sharma AK, Sharma R, Sharma S. Port site infection in laparoscopic surgeries-clinical study. Indian Med Gazette 2013, 224-9.
9. Chaudhuri S, Sarkar D, Mukerji R. Diagnosis and management of atypical mycobacterium infection after laparoscopic surgery. Indian J Surg.2010; 72:438-442.
10. Alam MR, Nuruzzaman M, Begum M, Alim MA, Rahman MM, Karim MR, Alam MI. The frequency of port site infection in laparoscopic cholecystectomies. Med Today.2021;25:22-26.
11. Vikas Kumar Heer, Suhail Khuroo, Aijaz Ahmad Wani, Sonia Nagyal, Beena Jad. Outcome of surgical management of post laparoscopy atypical mycobacterial port site infections: Is early surgery a better alternative. Surgery in practice and science.2022;8:1-5.
12. R. Aziz. Practical manual of operative laparoscopy. Springer-Verlag, New York.1992:1-8.
13. E Wolinsky. Nontuberculous mycobacteria and associated disease. Am Rev Respir Dis.1997;119(1):107-159.
14. Sasmal P, Mishra T,Rath S,Mehar S. Port site infection in laparoscopic surgery. A review of its management.http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4607803
15. M. A. Mir, U Y Malik, H Wani, B.S Bali. Prevelance, patteren, sensitivity and resistance to antibiotics of different bacteria isolated from port site infection in low risk patients after elective laparoscopic cholecystectomy for symptomatic cholelithiasis at tertiary care hospital of Kashmir.Int Wound J.2013;10:110-113.
16. R. Krishnappa, I. Samarasam. Atypical mycobacterial infection in post laparoscopy surgical wounds: Our observation and review of literature. Int. Surg J. 2017; 4(9):2943-2946.
17. Ramkaran Chaudhary, Vibhor Tak, Akshat Dutt et al. Current trends in the management of port site infections: A case series and review of published work. Cureus. 2023;15(6): e40936.
18. H. Ramesh, K. Prakash, V. Lekha, G. Jacob, A. Venugopal, B.Venugopal. Port site tuberculosis after laparoscopy: report of eight cases. Surg Endosc. 2003;17: 930-932.
19. Narreddy SR, Guleria S, Agarwal S, Svr CM, Mandal S. Recurrent abscess at site of laparoscopic cholecystectomy port due to spilled gallstones. Indian J Gastroenterol.2001;20:161.

Original Article

Radiological and Clinical Correlation of Lumbar Disc Degeneration in Adults: a Cross-Sectional Study in a Tertiary Care Hospital

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Abstract

Background: Lumbar disc degeneration (LDD) is a major cause of chronic low back pain and disability worldwide. It results from aging, genetics, mechanical stress, and environmental factors, often leading to pain, limited mobility, and reduced quality of life. Although MRI is the gold standard for assessing disc degeneration, radiological findings often do not match clinical symptoms. Understanding clinical–radiological correlation is essential for improving diagnosis and management in Bangladeshi tertiary care settings. **Objectives:** To evaluate MRI-based lumbar disc degeneration and its correlation with clinical symptoms, disability scores, and associated demographic and lifestyle factors. **Material and Methods:** This analytical cross-sectional study was conducted in the Orthopaedics Departments of Satkhira District Hospital and Satkhira Medical College Hospital over 12 months. The study population consisted of 42 adult patients with chronic low back pain, selected through purposive sampling. All participants underwent MRI evaluation using the Pfirrmann grading system and disability assessment via the ODI. Data were collected using structured forms and analyzed with SPSS 26. Ethical approval and informed consent were obtained. **Result:** Most patients were aged 41–50 years (31%), with males comprising 57.1%. Manual laborers formed the largest occupational group (28.6%). Nearly half were obese (47.6%). Severe pain (VAS 7–10) was reported by 50%, and 38.1% had moderate disability, while 33.3% showed severe disability. Grade III degeneration was most common (35.7%). L4–L5 (71.4%) and L5–S1 (61.9%) were the most affected levels. Strong correlations existed between Pfirrmann grade, VAS, and ODI scores. **Conclusion:** Lumbar disc degeneration showed strong correlation with pain and disability, highlighting the need to combine MRI findings with comprehensive clinical assessment.

Keywords: Lumbar disc degeneration, Low back pain, Pfirrmann grading, MRI.

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Introduction

Lumbar disc degeneration (LDD) is one of the most common musculoskeletal disorders affecting adults worldwide and represents a major cause of chronic low back pain (LBP), disability, and socioeconomic burden. Degenerative changes of the intervertebral disc occur due to a combination of aging, genetic susceptibility, mechanical loading, and environmental factors, ultimately leading to progressive structural and biochemical deterioration of disc tissue [1, 2]. Although disc degeneration may

remain asymptomatic in many individuals, symptomatic cases frequently present with pain, radiculopathy, restricted mobility, and impaired functional capacity, significantly affecting the patient's quality of life [3].

The global burden of low back pain continues to rise, with the Global Burden of Disease (GBD) study consistently identifying it as the leading cause of years lived with disability (YLDs) across all age groups [4]. In South Asia, including Bangladesh, the magnitude of disability from LBP is substantial due to a high prevalence of physically demanding occupations, poor ergonomic practices, and limited access to early diagnosis and preventive measures [5]. Lumbar disc degeneration has been reported as a central pathological contributor to chronic LBP in adults presenting to orthopaedic and spine clinics in developing countries [6].

Radiological evaluation plays a crucial role in assessing the extent and severity of disc degeneration. Magnetic resonance imaging (MRI) is widely regarded as the gold standard due to its superior visualization of disc hydration, annular integrity, and adjacent structures. The most commonly used radiological grading system, the Pfirrmann classification, provides a reliable method for assessing disc signal intensity, disc height, and nucleus–annulus distinction across five grades [7]. However, radiological severity does not always correlate directly with clinical symptoms. Multiple studies have shown substantial variability between MRI findings and the degree of pain or disability experienced by patients, suggesting that radiological degeneration alone may not fully account for symptom severity [8, 9].

Because of this discrepancy, clinical assessment tools are essential for quantifying functional disability. The Oswestry Disability Index (ODI), first developed by Fairbank and colleagues, is one of the most widely validated instruments for evaluating disability related to lumbar spine disorders [10]. It assesses ten domains—pain intensity, personal care, lifting, walking, sitting, standing, sleeping, social life, traveling, and employment/homemaking—providing a comprehensive measure of functional limitations. The ODI is frequently used in clinical research to quantify the impact of LDD and monitor treatment outcomes. Despite increasing awareness of spine disorders in Bangladesh, limited data exist regarding the clinical and radiological correlation of lumbar disc degeneration among adults attending tertiary care hospitals, particularly outside major urban centers. Satkhira District Hospital and Satkhira Medical College and Hospital, serving a large semi-urban and rural population, frequently encounter patients with LBP of varying etiologies. Understanding the pattern of disc degeneration in this population and its relationship with clinical disability is essential for improving diagnostic accuracy, patient counseling, and targeted rehabilitation strategies.

This study aims to assess the radiological features of lumbar disc degeneration and explore their correlation with clinical findings and functional disability, as measured by the ODI, among adult patients presenting with low back pain in a tertiary care setting.

Objectives

To assess the radiological and clinical correlation of lumbar disc degeneration among adult patients attending the Orthopaedics Department of Satkhira District Hospital and Satkhira Medical College and Hospital.

Methods

This hospital-based analytical cross-sectional study was carried out in the Department of Orthopaedics, Satkhira District Hospital, and the Department of Orthopaedics, Satkhira Medical College and Hospital, Bangladesh.

Both institutions are tertiary care referral centers serving a diverse patient population from semi-urban and rural regions. The study was conducted over a 12-month period, from January to December 2024. The primary aim was to determine the radiological patterns of lumbar disc degeneration (LDD) and examine their association with clinical disability and pain severity in adult patients presenting with chronic low back pain (LBP). A total of 42 participants were selected using a purposive, non-probability sampling technique. All eligible patients presenting to the outpatient and inpatient Orthopaedics departments with complaints of chronic LBP and subsequently advised for MRI of the lumbosacral spine during the study period were approached for inclusion. Participation required willingness to undergo structured clinical assessment and completion of validated functional disability questionnaires. This study included adult patients aged 18 years and above who presented with chronic low back pain lasting at least three months, with or without associated radiculopathy. Eligible participants were those who underwent MRI of the lumbar spine at the study centers and were able to fully comprehend the study procedures and provide informed written consent. Patients were excluded if they had a history of spinal trauma, vertebral fractures, previous spinal instrumentation, or known spinal infections such as tuberculosis or osteomyelitis. Additional exclusion criteria included spinal malignancy, congenital deformities, inflammatory arthropathies such as ankylosing spondylitis, pregnancy due to MRI precautions, incomplete or poor-quality MRI images, and inability to complete the required clinical questionnaires. Data collection was performed using a pre-designed, structured case record form specifically created for this study. The form included demographic information, occupational history, clinical symptoms, functional assessment, and radiological findings. All data were collected by trained Orthopaedic researchers under the supervision of senior faculty to ensure accuracy and minimize observer bias.

The study sought to determine:

- Correlation between Pfirrmann MRI grades and VAS pain severity
- Correlation between MRI grades and ODI disability scores
- Association of disc degeneration severity with demographic and lifestyle variables (age, BMI, occupation)

The analysis examined whether radiological deterioration corresponded with clinical impairment.

Ethical approval was obtained from the Institutional Review Board (IRB) of Satkhira Medical College and Hospital prior to the commencement of the study. The principles outlined in the Declaration of Helsinki (2013 revision) were observed. All participants received detailed verbal and written information about the objectives, procedures, risks, and benefits of the study. Written informed consent was obtained before enrolment. Confidentiality was strictly maintained through anonymization of patient identifiers. All statistical analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Although the sample size was limited to 42 due to the study's hospital-based nature, prior spine research has demonstrated adequate correlation analysis power with similar sample sizes. This sample size was deemed sufficient for detecting moderate associations between radiological and clinical parameters.

Results

A total of 42 adult patients with chronic low back pain were included in the study. The findings are presented below in tabulated and descriptive formats.

Table I: Distribution of Patients by Age (N = 42)

Age Group (Years)	Frequency n (%)
18–30	6 (14.3)
31–40	9 (21.4)
41–50	13 (31)
51–60	10 (23.8)
>60	4 (9.5)
Sex	
Male	24(57.1)
Female	18 (42.9)
Occupation	
Manual laborers	12 (28.6)
Office workers	10 (23.8)
Homemakers	9 (21.4)
Farmers	6 (14.3)
Others	5 (11.9)
BMI Category	
Normal (18.5–22.9)	10 (23.8)
Overweight (23–24.9)	12 (28.6)
Obese (≥25)	20 (47.6)

Description: Most patients belonged to the 41–50 years age group (31%). Only 14.3% were younger adults aged 18–30 years. The age distribution suggests a higher burden of LDD among middle-aged individuals. The study sample showed a male predominance (57.1%). However, females also represented a substantial proportion of cases. Manual laborers constituted the largest occupational group (28.6%). Homemakers and office workers also represented notable proportions. Occupational physical load appears to influence LDD risk. Nearly half (47.6%) of the patients were obese. Only 23.8% had normal BMI. The findings suggest a strong pattern of overweight/obesity among LDD patients.

Table II: Distribution of Pain Severity (VAS Score)

Pain Severity (VAS)	Frequency n (%)
Mild (1–3)	3 (7.1)
Moderate (4–6)	18 (42.9)
Severe (7–10)	21 (50)

Description: Half of the patients reported severe pain (VAS 7–10). Moderate pain accounted for 42.9% of cases. Only a small percentage experienced mild pain.

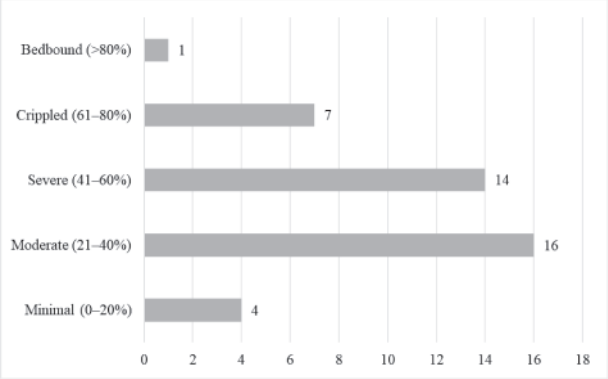

Figure I: Oswestry Disability Index (ODI) Categories

Description: Most patients fell into moderate (38.1%) or severe (33.3%) disability categories. A small number (2.4%) were completely incapacitated.

Table III: Distribution of Disc Degeneration by Pfirrmann Grades.

Pfirrmann Grade	Frequency n (%)
Grade I	3 (7.1)
Grade II	8 (19)
Grade III	15 (35.7)
Grade IV	11 (26.2)
Grade V	5 (11.9)

Description: Grade III degeneration was the most common (35.7%), followed by Grade IV (26.2%). Severe degeneration (Grades IV–V) represented 38.1% of cases.

Table IV: Most Commonly Affected Lumbar Disc Levels (Multiple Responses).

Disc Level	Frequency of Involvement n (%)
L1–L2	4 (9.5)
L2–L3	6 (14.3)
L3–L4	12 (28.6)
L4–L5	30 (71.4)
L5–S1	26 (61.9)

Description: L4–L5 was the most frequently affected disc level (71.4%), followed by L5–S1 (61.9%). Upper lumbar levels showed much lower involvement.

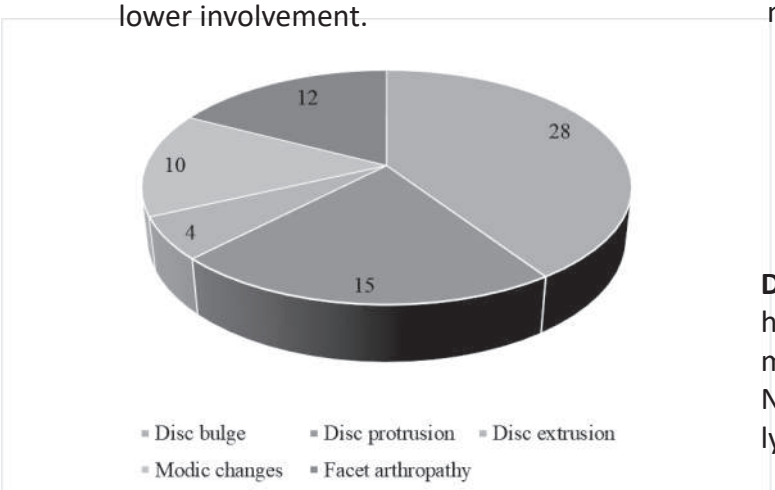

Figure 2: Additional MRI Findings.

Description: Disc bulge was the most frequent additional MRI finding (66.7%). Modic changes and facet arthropathy were also commonly observed.

Table V: Correlation Between Pfirrmann Grade and VAS Score.

Correlation Test	Value
Pearson r	0.612
p-value	<0.001

Description: There was a strong, statistically significant positive correlation between radiological degeneration and pain severity. Higher Pfirrmann grades were associated with higher VAS scores.

Table VI: Correlation Between Pfirrmann Grade and ODI Score

Correlation Test	Value
Pearson r	0.658
p-value	<0.001

Description: A strong positive correlation was found between disc degeneration severity and functional disability. Higher MRI grades predicted higher ODI percentages.

Table VII: Relationship between BMI and Pfirrmann Degeneration Severity

BMI Category	Mean Pfirrmann Grade ± SD
Normal	2.3 ± 0.8
Overweight	3.1 ± 0.9
Obese	3.9 ± 1.1

Description: Obese patients demonstrated the highest mean Pfirrmann grade, indicating more advanced disc degeneration. Normal-weight individuals showed significantly lower grades.

Discussion

In this cross-sectional study of 42 adult patients with chronic low back pain, we found a statistically significant positive correlation between MRI-graded lumbar disc degeneration (via Pfirrmann classification) and functional disability measured by the Oswestry Disability Index (ODI) [11]. This finding supports the hypothesis that structural degeneration of intervertebral discs contributes, at least in part, to the clinical burden of low back pain.

Our findings align with those of Middendorp et al., who reported a weak but significant correlation between Pfirrmann grade at L4/5 and L5/S1 and ODI scores in a larger cohort [12]. Similarly, Foizer et al. demonstrated that patients with higher maximal and summed

Pfirrmann grades had higher ODI values, although the association was moderate [13]. These studies collectively suggest that while disc degeneration contributes to disability, it is not the sole determinant of functional impairment.

The multifactorial nature of low back pain is further highlighted by advanced imaging studies. Arpinar et al. found significant associations of ODI with both endplate perfusion and biochemical changes in the nucleus pulposus, implying that inflammatory and metabolic processes may influence pain and disability beyond structural degeneration [14]. Our study also observed additional MRI findings such as Modic changes and facet arthropathy in a considerable number of patients, which may partially explain variability in functional outcomes beyond Pfirrmann grading [15].

Age and psychosocial factors also modulate the disc degeneration–pain relationship. Mertimo et al. demonstrated that mental distress attenuated the association between lumbar disc degeneration and pain intensity in a population-based cohort [16]. This underscores the importance of integrating psychosocial evaluation into the assessment of patients with low back pain, as structural degeneration alone may not fully predict disability.

Quantitative MRI techniques, such as T2 mapping and T1ρ imaging, can detect early compositional changes in discs before visible Pfirrmann-grade alterations occur. Paul et al. highlighted that these modalities may better reflect microstructural degeneration and correlate more closely with functional outcomes [17]. Such techniques could improve sensitivity in future studies exploring imaging–clinical correlations.

Our findings also have practical implications for clinical management. While MRI remains valuable for diagnosing lumbar disc degeneration, imaging findings should be interpreted alongside patient-reported disability, pain intensity, and clinical examination. Modic-type endplate changes, linked with inflammation, could serve as potential therapeutic targets, guiding interventions beyond structural correction [18, 19].

Despite these insights, our study has limitations. The small sample size (n = 42) limits generalizability, and the cross-sectional design precludes causal inference. Advanced imaging modalities were not used, and psychosocial variables were not formally assessed. Future research should incorporate longitudinal designs, quantitative imaging biomarkers, and comprehensive psychosocial assessment to clarify the complex interplay between disc degeneration, pain, and disability [20–23].

Our study demonstrates a positive correlation between lumbar disc degeneration and functional disability in patients with chronic low back pain. However, the moderate strength of the association indicates that disc degeneration is only one component of a multifactorial condition. A holistic approach that integrates structural imaging, clinical assessment, and psychosocial factors is essential for optimal management.

Conclusion

The study demonstrates a significant positive correlation between lumbar disc degeneration, as graded by MRI, and functional disability measured by the Oswestry Disability Index in adult patients with chronic low back pain. Middle-aged adults, particularly those with higher BMI and physically demanding occupations, were more likely to exhibit severe disc degeneration. While radiological findings provide important structural information, they only partially explain the variability in pain and disability. Therefore, clinical assessment should integrate imaging findings with func-

tional and psychosocial evaluations to guide optimal management.

Limitations of the Study: Despite providing valuable insights into the correlation between lumbar disc degeneration and functional disability, this study has several limitations. First, the sample size was relatively small (n = 42), which may limit the statistical power and generalizability of the findings. Second, the cross-sectional design precludes establishing causality; it is unclear whether disc degeneration caused the disability or vice versa. Third, we relied on conventional MRI (Pfirrmann grading) and did not use advanced imaging modalities such as T1ρ, T2 mapping, or diffusion-weighted imaging that could detect early biochemical and microstructural changes. Fourth, psychosocial factors such as depression, anxiety, and occupational stress, which may influence pain perception and disability, were not assessed. Finally, the study was conducted in a single tertiary care setting, which may limit the applicability of the findings to other populations.

Recommendations: Clinicians should interpret MRI findings in conjunction with patient-reported pain and functional disability, rather than relying solely on radiological degeneration to guide treatment decisions.

1. Patients should be counseled on lifestyle modifications, including weight management and ergonomic adjustments, to reduce the progression of disc degeneration and associated disability.

2. Larger, multicenter, longitudinal studies are recommended to establish causal relationships between disc degeneration and disability.

3. Incorporation of quantitative MRI modalities (e.g., T1ρ, T2 mapping) and evaluation of endplate changes could provide more sensitive measures of disc health and better correlate with functional outcomes.

4. Future studies should include psychosocial and occupational factors to better understand the multifactorial nature of low back pain and improve individualized management strategies.

References

1. Adams MA, Roughley PJ. What is intervertebral disc degeneration, and what causes it? Spine. 2006;31(18):2151-2161. doi:10.1097/01.brs.0000231761.73859.2c

2. Battie MC, Videman T. Lumbar disc degeneration: epidemiology and genetic influences. Spine. 2006;31(23):2679–2690. doi:10.1097/01.brs.0000244585.46842.c2

3. Hartvigsen J, Hancock MJ, Kongsted A, et al. What low back pain is and why we need to pay attention. Lancet. 2018;391:2356–2367. doi:10.1016/S0140-6736(18)30480-X

4. Global Burden of Disease Study 2019. Lancet. 2020;396:1204–1222. doi:10.1016/S0140-6736(20)30925-9

5. Hoque DME, Rahman M, Billah SM, et al. Low back pain and associated occupational factors among Bangladeshi workers. J Occup Health. 2018;60(2):165–173. doi:10.1539/-joh.17-0177-OA

6. Shamim M, Akhter S, Islam MS. Pattern of degenerative disc disease among patients with low back pain in Bangladesh. Bangladesh Med Res Counc Bull. 2017;43(3):147–152. doi:10.3329/bmrcb.v43i3.34613

7. Pfirrmann CW, Metzdorf A, Zanetti M, et al. Magnetic resonance classification of lumbar intervertebral disc degeneration. Spine. 2001;26(17):1873–1878. doi:10.1097/00007632-200109010-00011

8. Brinjikji W, Luetmer PH, Comstock B, et al. Systematic literature review of imaging features of spinal degeneration in asymptomatic adults. AJNR. 2015;36(4):811–816. doi:10.3174/ajnr.A4173

9. Hancock MJ, Maher CG, Macaskill P, et al. MRI findings are not associated with clinical

severity in low back pain. Spine. 2011;36(25):2151–2160. doi:10.1097/BRS.0b013e3182388f57

10. Fairbank JCT, Pynsent PB. The Oswestry Disability Index. Spine. 2000;25(22):2940–2953. doi:10.1097/00007632-200011150-00017

11. Middendorp M, Katzenellenbogen J, Meiler WF, et al. Association between intervertebral disc degeneration and the Oswestry Disability Index. J Back Musculoskelet Rehabil. 2017;30(4):819-823. doi:10.3233/BMR-150516

12. Foizer GA, Oliveira AAR, Leite FBR, et al. Is there any association between the severity of disc degeneration and low back pain? Rev Bras Ortop. 2022;57(2):336–343. doi:10.1097/BRS.0b013e3181aa5b33

13. Arpinar VE, Gliedt JA, King JA, Maiman DJ, Muftuler LT. Oswestry Disability Index scores correlate with MRI measurements in degenerating intervertebral discs and endplates. Eur J Pain. 2020;24(2):346–353. doi:10.1002/ejp.1490

14. Modic MT, Masaryk TJ, Ross JS, Carter JR. Degenerative disk disease: assessment of changes in vertebral body marrow with MR imaging. Radiology. 2007;245(1):158–167. doi:10.1148/radiol.2451051706

15. Özkoçak G. Clinical impact of disc degeneration, Modic changes, and paraspinal muscle atrophy: a cross-sectional observational study. Aydın J Health. 2025;11(3):251–262.

16. Mertimo T, Niinimäki J, Karppinen J, et al. Association of lumbar disc degeneration with low back pain is modified by mental distress: a population-based study. BMC Musculoskelet Disord. 2022;23:930. doi:10.1186/s12891-022-05302-z

17. Paul CPL, Urban JPG, Williams D, et al. Quantitative MRI in early intervertebral disc degeneration. PLoS One. 2018;13(3):e0191442. doi:10.1371/journal.pone.0191442

18. Singh R, Sharma M, Kadam A. A comparative study to evaluate disc degeneration on MRI in symptomatic versus asymptomatic low back pain patients. SAGE Open Med. 2021;9:20503121211039522. doi:10.1177/22104917211039522

19. Jha A, Ghimire P, Paudel N, Jha S. MRI assessment of lumbar intervertebral disc degeneration and its association with Modic changes. J Nepalgunj Med Coll. 2022;22(2):[page numbers]. doi:10.3126/jngmc.v22i2.74114

20. Salo S, Heikkilä K, Mäkinen V-P, et al. Association between severe lumbar disc degeneration and occupational physical loading. J Occup Health. 2022;64(1):e12316. doi:10.1002/1348-9585.12316

21. Lin Y-H, Yeh H-C, Ko C-H, et al. Associations of preoperative Oswestry Disability Index and EuroQol 5D with long-term outcomes in lumbar fusion patients. Arch Med Sci. 2022;18(5):[page numbers]. doi:10.5114/aoms/204372

22. Esposito D, van Vulpen LFD, Vos FM, Verkooijen HM. MRI-based grading systems for assessing lumbar intervertebral disc degeneration: a systematic review. Figshare. 2023. doi:10.6084/m9.figshare.46169340.v1

23. Gassara Z, et al. Is there a relationship between MRI-measured disc degeneration levels and pain/disability? Neurosci Biobehav Rev. 2025; (abstract). doi:10.1016/j.neubiorev..2025.05.017.

Original Article

Postoperative Complications Following Percutaneous Nephrolithotomy

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Abstract

Background: Percutaneous nephrolithotomy (PCNL) is the preferred treatment for large renal calculi; however, postoperative infective complications remain a concern despite its effectiveness. **Objective:** To determine the proportion and pattern of postoperative infective complications following PCNL. **Methods:** This institution-based observational study was conducted in the Department of Urology, Satkhira Medical College Hospital, from January 2023 to December 2025. All patients undergoing PCNL during this period were included. Demographic data and patient-, stone-, and procedure-related variables were analyzed to assess postoperative infective outcomes. **Results:** A total of 118 patients were included, with a mean age of 42.4 ± 13.2 years. Males slightly predominated (55.9%). Stone laterality was nearly equal between right (51.7%) and left (48.3%) kidneys. Postoperative fever was the most common infective complication, occurring in 20 patients (16.9%). Urinary tract infection was observed in 10 patients (8.5%), pyelonephritis in 7 patients (5.9%), and sepsis in 1 patient (0.8%). **Conclusion:** Postoperative infective complications following PCNL were more frequent in patients with preoperative urinary tract infection, previous renal surgery, larger stone burden, prolonged operative time, and residual calculi. Careful patient selection and optimization of perioperative management may help reduce these complications.

Keywords: Percutaneous nephrolithotomy; postoperative infection; urinary tract infection; pyelonephritis; sepsis.

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Introduction

Percutaneous nephrolithotomy (PCNL) is widely accepted as the treatment of choice for renal calculi larger than 2 cm [1]. It is also recommended for lower pole stones greater than 1 cm, stones in the upper ureter when extracorporeal shock wave lithotripsy (ESWL) has failed or is contraindicated, and for upper urinary tract stones not amenable to retrograde intrarenal surgery (RIRS) [1].

Despite its effectiveness, PCNL is associated with perioperative complications in up to one-third of patients [2]. Postoperative fever and urinary tract infection (UTI) are the most common complications, accounting for approximately 21%–40% of reported adverse events [3]. Infective complications are particularly concerning, as they may progress to severe systemic infection [4], and sepsis has been identified as a leading perioperative cause of mortality following PCNL [5].

Several studies have evaluated patient-related, stone-related, and procedure-related factors

influencing postoperative complications [6]. The incidence of urosepsis following PCNL has been reported to range from 0.9% to 4.7% [7]. Factors such as prolonged operative time, increased bacterial load in urine, severity of urinary tract obstruction, and the presence of infected stones significantly increase the risk of postoperative febrile UTI and urosepsis [8, 9].

The present study was undertaken to assess postoperative infective complications following PCNL and to identify patient-, stone-, and procedure-related risk factors associated with these complications.

Methods

Study Design and Setting: This was an institution-based observational study conducted in the Department of Urology, Satkhira Medical College Hospital.

Study Population: All patients who underwent percutaneous nephrolithotomy at the study center over a 3-year period from January 2023 to December 2025 were included in the study.

Aims and Objectives: To determine the proportion of patients who developed postoperative infective complications following PCNL.

Data Collection: Demographic details, clinical presentation (including pain and history of urinary tract infection), and associated comorbidities such as diabetes mellitus and systemic hypertension were recorded. Information regarding previous renal interventions, including open surgery, endoscopic procedures, and ESWL within the preceding 10 years, was also collected. A history of preoperative double-J (DJ) stenting or percutaneous nephrostomy (PCN) placement was noted.

Laboratory investigations included complete blood count (hemoglobin, total and differential leukocyte counts, erythrocyte sedimentation rate) and renal function tests (blood urea and serum creatinine). Radiological evaluation was performed using computed tomography (CT) to assess stone characteristics, while functional assessment was carried out using intravenous urography or CT urography.

Stone-related parameters evaluated included stone volume (cm^3), presence of staghorn calculi (complete or partial), associated upper ureteric stones, hydronephrosis, and stone density. Complete staghorn calculi were defined as stones involving two or more calyces, while partial staghorn calculi involved the renal pelvis with extension into two or fewer calyces.

Procedure-related variables included operative duration (≤90 minutes or >90 minutes), number of access tracts (single or multiple), tract size (≤22 Fr or >22 Fr), and use of nephrostomy tube or DJ stent.

Preoperative Management: All patients underwent urine culture testing prior to surgery. Those with positive cultures received culture-specific antibiotics until sterile urine was achieved. Surgery was deferred in patients with active infection or fever until clinical resolution. PCN was performed preoperatively in patients with pyonephrosis. Prophylactic antibiotics—either second-generation cephalosporins or culture-specific agents—were administered at the time of anesthesia induction.

Operative Technique: Under general anesthesia, retrograde ureteric catheterization was performed on the affected side. Patients were positioned prone, and percutaneous renal access was obtained under fluoroscopic guidance using an 18-gauge diamond-tip puncture needle. A hydrophilic guidewire was inserted, followed by tract dilatation using Alken metal dilators, and placement of an Amplatz sheath. Stone fragmentation was achieved using a pneumatic lithoclast, and fragments were removed. Intraoperative assessment of stone

clearance was performed fluoroscopically. A DJ stent, ureteric catheter, or nephrostomy tube was placed as indicated.

Postoperative Care and Definitions: Patients were monitored in the ward for 3–5 days post-operatively. Vital signs and total leukocyte count were assessed daily. Urine culture was obtained on the first postoperative day. Fever was defined as a temperature exceeding 38°C on any postoperative day. Pyelonephritis was diagnosed in patients with fever accompanied by a leukocyte count greater than 12,000/m-m³. Sepsis was diagnosed when at least two of the following criteria were present: abnormal leukocyte count (>12,000 or <4,000/mm³), temperature >38°C or <36°C, heart rate >90 beats/min, or respiratory rate >20 breaths/min. Residual calculi were evaluated using ultrasonography and X-ray, with stones larger than 8 mm considered clinically significant residual fragments.

Result

A total of 118 patients were included, with a mean age of 42.4 ± 13.2 years. Males slightly predominated (55.9%). Stone laterality was nearly equal between right (51.7%) and left (48.3%) kidneys (Table-1).

A total of 118 patients undergoing the procedure were analyzed. The majority presented with flank pain (81.4%), with comorbidities including diabetes mellitus in 50.8% and hypertension in 71.2% of cases. History of urinary tract infection (UTI) was noted in 25.4%, while a history of urosepsis was rare (1.7%). Ten patients (8.5%) had a past history of surgery. Regarding stone characteristics, staghorn stones were present in 10.2%, multiple stones in 14.4%, upper calyx stones in 5.9%, and ureteric stones in 5.1%. Hydronephrosis was observed in 67.8% of patients.- Most procedures were performed with a single puncture (88.1%) and a tract size of less than 28 Fr in 62.7% of cases. The operative duration was less than 90 minutes in 64.4% of patients. Residual calculi were present in 12.7% of cases post-procedure (table-2).

Postoperative fever was the most common infective complication, occurring in 20 patients (16.9%). Urinary tract infection was observed in 10 patients (8.5%), pyelonephritis in 7 patients (5.9%), and sepsis in 1 patient (0.8%) (Table-3).

Table I: Demographic Characteristics of the Study Population (n = 118).

Variable		Value
Age (years) (Mean ± SD)		42.4 ± 13.2
Sex	Male	66 (55.9%)
	Female	52 (44.1%)
Stone laterality	Right	61 (51.7%)
	Left	57 (48.3%)

Table II: Patient Characteristics and Procedural Details (n = 118).

Variable	Frequency n (%)
Flank pain	96 (81.4)
Diabetes Mellitus (DM)	60 (50.8)
Hypertension (HTN)	84 (71.2)
History of UTI	30 (25.4)
History of Urosepsis	2 (1.7)
Past history of surgery	10 (8.5)
Stone type	
Staghorn	12 (10.2)
Multiple	17 (14.4)
Upper calyx	7 (5.9)
Ureter	6 (5.1)
Hydronephrosis	80 (67.8)
Puncture number	
Single puncture	104 (88.1)
Multiple punctures	14 (11.9)
Tract size	
< 28 Fr	74 (62.7)
> 28 Fr	44 (37.3)
Operative duration	
< 90 min	76 (64.4)
> 90 min	42 (35.6)
Residual calculi present	15 (12.7)

Table II: Postoperative Infectious Complications Following PCNL (n = 118).

Outcome	Frequency n (%)
Fever	20 (16.9)
UTI	10 (8.5)
Pyelonephritis	7 (5.9)
Sepsis	1 (0.8)

Discussion

Percutaneous nephrolithotomy (PCNL) remains the most commonly performed procedure for large and complex renal stones. While the safety and efficacy of the procedure are well established, infectious complications continue to pose significant risks, often resulting in prolonged hospitalization and additional antibiotic therapy. Sepsis has been identified as the leading cause of perioperative mortality following PCNL [10].

In the present study, the incidence of postoperative infectious complications was as follows: fever in 16.9%, urinary tract infection (UTI) in 8.5%, pyelonephritis in 5.9%, and sepsis in 0.8%. Rivera et al. [10] conducted a prospective study of 227 patients and reported infectious complications in 16%, including UTI/pyelonephritis in 5%, systemic inflammatory response syndrome (SIRS) in 9%, and sepsis in 0.9%. Similarly, Sharma et al. [11] analyzed data from the Clinical Research Office of the Endourological Society (CROES) and found that 10.4% of 5,313 patients developed postoperative fever (>38.5°C).

Several studies have investigated risk factors associated with infectious complications. Sharma et al. [11] found that renal failure (serum creatinine >1.4 mg/dL), staghorn calculi, severe preoperative hydronephrosis, multiple punctures, and prolonged operative duration were significant predictors. Consistent with our findings, diabetes mellitus and complete staghorn calculi were identified as major risk factors for infective complications by Wei et al. [12]. Yang et al. [13] reported that urine leukocyte count and stone size were predictive for both fever and SIRS, with postoperative complication rates of 12.2% for fever and 27.4% for SIRS. Other studies have also identified stone burden and history of recurrent urinary tract infections as independent risk factors for infectious complications, and preexisting urinary tract infection further increases the risk of postoperative fever.

In our study, the number of punctures, tract size, preoperative stenting, and presence of hydronephrosis were not significantly associated with infectious complications. Interestingly, a prior history of renal surgery was found to be a risk factor for postoperative fever and sepsis, which contrasts with some previous reports.

Conclusions

Post-PCNL complications are more commonly found in patients with a history of preoperative UTI, previous history or renal surgeries, large stone burden, operative procedure more than 90 min and presence of residual calculi. The number or size of the tracts was not associated with significant risk. This study was conducted in a single institute with different surgeons performing the same procedure.

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Conflicts of interest: None.

References

1. Türk C, Neisius A, Petrik A, Seitz A, Skolarikos A, Thomas K, et al. Urolithiasis [Internet]. EAU; 2000. Available from: https://uroweb.org/guideline/urolithiasis/. [Last updated 2020; cited 2020 May 3].

2. Tefekli A, Karadag MA, Tepeler K, Sari E, Berberoglu Y, Baykal M, et al. Classification of percutaneous nephrolithotomy complications using the modified Clavien grading system: Looking for a standard. Eur Urol. 2008;53:184–90.

3. Draga RO, Kok ET, Sorel MR, Bosch RJ, Lock TM. Percutaneous nephrolithotomy: Factors

associated with fever after the first postoperative day and systemic inflammatory response syndrome. J Endourol. 2009;23:921–7.
4. Bozkurt IH, Aydogdu O, Yonguc T, Koras O, Sen V, Yarimoglu S, et al. Predictive value of leukocytosis for infectious complications after percutaneous nephrolithotomy. Urology. 2015;86:25–9.
5. De la Rosette J, Assimos D, Desai M, Gutierrez J, Lingeman J, Scarpa R, et al. The clinical research office of the endourological society percutaneous nephrolithotomy global study: Indications, complications, and outcomes in 5803 patients. J Endourol. 2011;25:11–7.
6. Labate G, Modi P, Timoney A, Cormio L, Zhang X, Louie M, et al. The percutaneous nephrolithotomy global study: Classification of complications. J Endourol. 2011;25:1275–80.
7. Michel MS, Trojan L, Rassweiler JJ. Complications in percutaneous nephrolithotomy. Eur Urol. 2007;51:899–906.
8. Mariappan P, Tolley DA. Endoscopic stone surgery: Minimizing the risk of post-operative sepsis. Curr Opin Urol. 2005;15:101–5.
9. Mariappan P, Smith G, Moussa SA, Tolley DA. One week of ciprofloxacin before percutaneous nephrolithotomy significantly reduces upper tract infection and urosepsis: A prospective controlled study. BJU Int. 2006;98:1075–9.
10. Rivera M, Viers B, Cockerill P, Agarwal D, Mehta R, Krambeck A. Pre- and postoperative predictors of infection-related complications in patients undergoing percutaneous nephrolithotomy. J Endourol. 2016;30:982–6.
11. Sharma K, Sankhwar NS, Goel A, Singh V, Sharma P, Garg Y. Factors predicting infectious complications following percutaneous nephrolithotomy. Urol Ann. 2016;8:434–8.
12. Wei W, Leng J, Shao H, Wang W. Diabetes, a risk factor for both infectious and major complications after percutaneous nephrolithotomy. Int J Clin Exp Med. 2015;8:16620–6.
13. Yang T, Liu S, Hu J, Wang L, Jiang H. The evaluation of risk factors for postoperative infectious complications after percutaneous nephrolithotomy. Biomed Res Int. 2017;2017:1–7.

Original Article

Comparative Study of Using Blind (Landmark Technique) and USG Guided Brachial Plexus Block

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Abstract

Background & objectives: Brachial plexus block (BPB) is a well-established and effective anesthesia technique for surgeries of the lower arm, forearm, and hand. BPB ensures optimal surgical conditions through complete muscle relaxation, stable intraoperative hemodynamics, sympathetic block, and prolonged postoperative analgesia. The introduction of ultrasound guidance has improved the safety and accuracy of BPB, offering higher success rates and fewer complications than traditional techniques. The objective of this study was to compare the effectiveness and success rate of the blind (Landmark Technique) and ultrasound-guided approaches for performing supraclavicular brachial plexus block. **Methods:** This prospective observational study was conducted at the Department of Anesthesia, Satkhira Medical College & Hospital, Satkhira, Bangladesh, from Jan 2025 to Aug 2025. The study included ninety patients aged 18 to 65 years who were scheduled for upper limb surgeries. Ethical approval was obtained, and informed consent was acquired from all participants. The patients were randomly assigned to two groups: Group LM (Landmark Technique) and Group US (Ultrasound-guided). Supraclavicular brachial plexus block was performed using either the Landmark or Ultrasound method. **Results:** The average age and gender distribution were similar between the two groups. However, the LM group had a higher mean weight. The procedure time was significantly shorter in the LM group (324±73 seconds) compared to the US group (606±121 seconds). Sensory and motor block onset occurred more quickly in the US group, which also experienced longer durations of both sensory and motor blocks. The success rate for the US group was 100%, while the LM group had a success rate of 86.67%. The US group had no reported complications, whereas the LM group had a complication rate of 15.56%. **Conclusion:** The study concluded that ultrasound-guided supraclavicular brachial plexus block is superior to the landmark technique. The ultrasound-guided approach achieved a 100% success rate, faster sensory and motor block onset, longer anesthesia duration, and no complications. In contrast, the landmark technique had a lower success rate of 86.67% and a complication rate of 15.56%, despite having a shorter procedural time.

Keywords: Landmark technique, USG Guided and Brachial Plexus Block.

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Introduction

Brachial plexus block (BPB) is a well-established, safe, and effective anesthesia technique for surgeries involving the distal upper limb, including the lower arm, forearm, and hand [1]. It provides dense anesthesia of the brachial plexus, ensuring optimal surgical conditions by enabling complete muscle relaxation, stable intraoperative hemodynamics, sympathetic block, and prolonged postoperative analgesia [2]. Key benefits of this technique include excellent intraoperative anesthesia, effective muscle relaxation, improved pain scores during recovery, and lower incidences of nausea and vomiting [2]. Furthermore, BPB may offer greater cost-effectiveness compared to general anesthesia [3]. Several approaches, including the supraclavicular, interscalene, infraclavicular, and axillary techniques, have been employed for brachial plexus blockade, each offering rapid onset and reliable anesthesia [4]. Among these, the supraclavicular approach is one of the most commonly utilized, as it provides consistent and predictable anesthesia across the entire upper extremity. Additionally, the supraclavicular approach is considered one of the easiest and most effective methods for achieving brachial plexus blockade [5]. Often referred to as the “spinal of the arm” due to its comprehensive anesthesia in this area, the supraclavicular method was first described by Kulenkampff in 1912 [6]. Recently, regional anesthesia techniques, favored for their affordability, effectiveness, safety, and postoperative advantages, have grown more popular than general anesthesia [6].

The interscalene brachial plexus block can be administered using various methods: the conventional blind technique or ultrasound (US)-guided approaches. In the traditional technique, commonly referred to as the landmark method, anesthesiologists use the paresthesia technique, inserting a needle at specific anatomical landmarks until the patient reports sensation in the relevant sensory distribution [7]. This conventional landmark technique for the supraclavicular block often requires multiple needle insertions, which can prolong the procedure, cause discomfort, and increase the risk of complications such as nerve and vascular injury [8]. In recent years, ultrasound guidance has become widely adopted for peripheral nerve blocks, allowing anesthesiologists to directly visualize the nerves, the needle tip, and the distribution of local anesthetic [7]. Moreover, ultrasound imaging provides clear visualization of surrounding structures, such as blood vessels and lungs [7]. As a result, ultrasound guidance has progressively established itself as the standard approach in regional anesthesia [8].

The advent of ultrasound technology and advancements in anatomical sonography have revolutionized regional anesthesia, enabling precise needle placement, clear visualization of nerve and plexus structures, and continuous monitoring of local anesthetic spread. These improvements enhance safety, reduce complication rates, and increase the success rate of ultrasound-guided supraclavicular brachial plexus blocks [10]. Studies have shown that ultrasound guidance yields higher success rates and faster sensory and motor blockade onset times. For instance, one study reported an 85% success rate for ultrasound-guided blocks, compared to 78% for nerve stimulation techniques, underscoring the benefits of visualizing anatomical structures during the procedure [11]. Furthermore, ultrasound-guided brachial plexus blocks not only enhance the accuracy of anesthetic delivery but also reduce the risk of accidental injury to nearby vascular and neural structures [11,12]. Given the clear advantages of ultrasound guidance over

conventional techniques, this study aims to compare the effectiveness and success rate of blind (Landmark Technique) and ultrasound-guided approaches for supraclavicular brachial plexus block.

Methodology & Materials

This prospective observational study was conducted at the Department of Anesthesia, Satkhira Medical College & Hospital, Bangladesh, from Jan 2025 to Aug 2025. Ninety patients scheduled for upper limb surgeries were included based on specific inclusion and exclusion criteria and were randomly divided into two groups: Group LM (Landmark Technique) and Group US (Ultrasound-guided technique). Ethical approval and informed consent were obtained. All patients received pre-anesthetic evaluations and premedication. The supraclavicular brachial plexus block was performed under aseptic conditions with 30 ml of 0.5% bupivacaine & 2%lignocaine. In the Landmark technique, the subclavian artery was palpated, and after skin infiltration with 2% lignocaine, an 20G needle was inserted for the block. In the Ultrasound technique, the subclavian artery was visualized with ultrasound, and an 20G needle was guided to the brachial plexus sheath, with the anesthetic injected after feeling a "pop." Procedure time, sensory and motor blockade onset, and duration were recorded. Hemodynamic parameters were monitored, and motor and sensory recovery were assessed post-surgery. Data collected included age, gender, weight, and procedure details like time taken, onset, and duration of blockade, as well as block failure cases. Sensory and motor blocks were graded, and statistical analysis was performed using SPSS software. Continuous data were expressed as mean±SD, while categorical data were presented as numbers (%). Significance was assessed using chi-square and independent t-tests at a 5% confidence level.

Result

The average age was 32.07 ± 12.34 years in the Landmark (LM) group and 37.77 ± 17.72 years in the US group, with no statistically significant difference between the groups. The mean weight was higher in the LM group (58.9 ± 5.5 kg) compared to the US group (52.8 ± 8.8 kg). In terms of gender distribution, the LM group had 53.33% males and 46.67% females, while the US group had 62.22% males and 37.78% females, with no significant difference (Table 1). The time required for the procedure was notably shorter in the LM group (323.95 ± 72.51 seconds) compared to the US group (606.33 ± 121.13 seconds). The onset of sensory and motor blocks was faster in the US group, with sensory onset at 7.43 ± 2.87 seconds and motor onset at 14.76 ± 0.11 seconds, compared to 10.88 ± 4.66 seconds and 16.17 ± 2.77 seconds in the LM group, respectively. Additionally, the duration of motor blockade was longer in the US group (517.33 ± 95.79 seconds) versus the LM group (430.72 ± 80.9 seconds), as was the duration of sensory blockade (580 ± 97.49 seconds in the US group vs. 505.33 ± 92.13 seconds in the LM group) (Table 2). In terms of effectiveness, the US-guided method achieved a 100% complete block success rate, while the LM group had a slightly lower success rate, with 86.67% complete and 13.33% incomplete blocks. Complication rates were also significantly different; 15.56% of participants in the LM group experienced complications, while no complications were reported in the US group (Table 3).

Discussion

Regional anesthesia, especially brachial plexus blocks, plays a crucial role in modern anesthesiology for managing pain during upper limb surgeries. The supraclavicular approach to this block is preferred because it reliably provides complete anesthesia to the upper limb with a quick onset and consistent nerve coverage.

Table I: Demographic characteristics of the participants.

Variables	LM (n=45)		US (n=45)		P-value
	n	%	n	%	
Age	32.07±12.34		37.77±17.72		>0.05
Weight (kg)	58.9±5.5		52.8±8.8		
Gender					
Male	24	53.33	28	62.22	>0.05
Female	21	46.67	17	37.78	

Table II: Characteristics related to procedure.

Variables	LM (Mean±SD)	US (Mean±SD)	P-value
Time taken for procedure (in seconds)	323.95±72.51	606.33±121.13	<0.05
Onset of sensory	10.88±4.66	7.43±2.87	<0.05
Onset of Motor	16.17±2.77	14.76±0.11	<0.05
Duration of motor blockade	430.72±80.9	517.33±95.79	<0.05
Duration of Sensory blockade	505.33±92.13	580±97.49	<0.05

Table III: Outcome of the study among participants.

Variables	LM (n=45)		US (n=45)		P-value
	n	%	n	%	
Effectiveness					
Incomplete	6	13.33	0	0	<0.05
Complete	39	86.67	45	100	
Complications					
Present	7	15.56	0	0	<0.05
Absent	38	84.44	45	100	

Traditionally, this block is performed using anatomical landmarks, a technique often referred to as the "blind" or landmark-based approach. Although generally effective, the landmark technique presents challenges due to its reliance on indirect guidance. It is susceptible to inaccuracies, especially with anatomical variations or difficulty locating the interscalene groove, which may lead to block failure or require multiple needle passes [7].

The success of a brachial plexus block relies on multiple factors, including the chosen technique, the anesthetist's experience, the patient's body composition, and the dosage and type of anesthetic used. Recently, real-time ultrasound guidance has emerged as a valuable tool for peripheral nerve blocks and is quickly gaining importance in regional anesthesia. This advancement has enhanced the success rate of supraclavicular brachial plexus blocks by allowing visualization of the brachial plexus, subclavian artery, first rib, and pleura, leading to more precise and effective blocks [13].

This prospective observational study examined the efficacy, safety, and procedural characteristics of blind landmark-guided (LM) versus ultrasound (US)-guided supraclavicular brachial plexus blocks in patients undergoing elective upper limb surgeries. The average age was slightly higher in the US group (37.77 ± 17.72 years) than in the LM group (32.07 ± 12.34 years), though this difference was not statistically significant. Gender distribution was also similar, with 53.33% males and 46.67% females in the LM group and 62.22% males and 37.78% females in the US group. Although average weight differed between groups, this difference was not statistically tested. Variations in weight could influence needle depth and anesthetic spread, particularly in landmark-guided techniques, as anatomical landmarks may be affected by body composition. However, ultrasound guidance allows the operator to visualize nerve structures directly, minimizing the effect of weight differences on procedural accuracy. This demographic distribution is consistent with the general patient population receiving brachial plexus blocks, supporting the sample's representativeness [7,11,14,15].

In terms of procedural characteristics, the time required for the US-guided block was significantly longer compared to the LM technique. Both techniques were performed by consul-

tants, who were more accustomed to the landmark approach, which contributed to the shorter block time for this method. In contrast, ultrasound guidance was a relatively newer skill, requiring additional time. Routine use of ultrasound guidance in clinical practice demands advanced ultrasonographic equipment and extensive training to achieve proficiency [16]. Williams et al. conducted a study to determine the number of brachial plexus blocks required to achieve a satisfactory level of proficiency with the technique. They estimated that performing at least 62 blocks is necessary to reach a success rate of 87% [10]. The extended time required for block performance in the US group can be attributed to moderate proficiency in ultrasound use.

Our study demonstrated that the onset of both sensory and motor blockade was significantly quicker in the US-guided group compared to the LM group. Similarly, a study by Raghove et al. also found that sensory and motor block onset occurred earlier in the US-guided group than in the conventional group [17]. The delayed onset observed in the landmark technique can be attributed to its blind approach, where the anesthetic is injected perivascularly with the expectation that it will diffuse around the nerves. In contrast, ultrasound guidance allows precise deposition of the anesthetic near the nerve plexus under direct visualization, accelerating the block's onset.

The onset of motor blockade was closely aligned with that of sensory blockade, consistent with findings from studies by Williams et al., Honnannavar et al., and Veeresham et al. [10,11,18]. In our study, both sensory and motor blockade durations were notably longer in the ultrasound-guided group compared to the landmark group. Specifically, sensory blockade lasted 505.33 ± 92.13 minutes in the landmark group and 580 ± 97.49 minutes with ultrasound guidance. Likewise, motor blockade duration was 413.92 ± 79.66 minutes in the landmark group and extended to 518.33 ± 94.79 minutes in the ultrasound group, a statistically significant difference. This increased duration can be attributed to the precise deposition of anesthetic closer to the plexus, resulting in a denser blockade. Similarly, Dureja et al. observed longer durations of analgesia in both ultrasound and nerve stimulator groups compared to the conventional approach [15].

The block was successful in 86.67% of patients in group LM and 100% in the US group. Total failure of the block occurred in 13.33% of the LM group. Vincent W. S. Chan et al. found that the block was successful in 95% of cases after one attempt in a guided block [6]. The high success rate with USG can be explained by direct visualization of the plexus under ultrasound and drug injection around the plexus under real-time monitoring. None of our study groups had nerve injury, pneumothorax, or local anesthetic toxicity. Vessel puncture occurred in 15.56% of the LM group, whereas it was nil in the US group, and this difference was statistically significant. Karpal et al. reported no complications in their study of ultrasound-guided supraclavicular brachial plexus block [19]. In a study conducted by Veeresham et al., they observed vessel puncture in 16.67% of cases in a conventional group with no complications in the ultrasound-guided technique [18]. The use of ultrasound allows for better identification and avoidance of vascular structures, reducing the risk of vessel puncture.

The study has several limitations. The anesthesiologists' experience level with the ultrasound technique varied, possibly impacting the procedure time and success rates. The study did not account for the learning curve associated with ultrasound guidance. Also, the follow-up period was short, restricting the assessment of long-term outcomes and com-

plications associated with each technique.

Conclusion

The study concludes that ultrasound (US)-guided supraclavicular brachial plexus blocks have significant advantages over the traditional blind landmark (LM) technique. Key findings include a higher success rate (100% vs 86.67%), faster onset of sensory and motor blocks, and longer durations of anesthesia and motor blockade with the US method. Additionally, the US group experienced no complications, while the LM group had a 15.56% complication rate, mainly due to vessel punctures. Despite the longer procedural time for US-guided blocks, their increased precision, effectiveness, and safety make them a superior method for brachial plexus blocks in upper limb surgeries.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

References

1. Perlas A, Chan VW, Simons M. Brachial plexus examination and localization using ultrasound and electrical stimulation: a volunteer study. The Journal of the American Society of Anesthesiologists. 2003 Aug 1;99(2):429-35.

2. Brown DL, Cahill DR, Bridenbaugh LD. Supraclavicular nerve block: anatomic analysis of a method to prevent pneumothorax. Anesthesia & Analgesia. 1993 Mar 1;76(3):530-4.

3. Graff V, Gabutti L, Treglia G, Pascale M, Anselmi L, Cafarotti S, Regina DL, Mongelli F, Saporito A. Perioperative costs of local or regional anesthesia versus general anesthesia in the outpatient setting: a systematic review of recent literature. Brazilian Journal of Anesthesiology. 2023 Apr 21;73(3):316-39.

4. Moore DC. "Traditional" or Supraclavicular Technique. Regional Anesthesia and Pain Medicine. 1980;5(1):3-5.

5. Tarkase AA, Chauhan SD, Deshmukh S. Evaluation of supraclavicular brachial plexus block using a nerve stimulator versus ultrasound guidance. MedPulse International Journal of Anesthesiology. 2020 Sep;15(3):77-81.

6. Chan VW, Perlas A, Rawson R, Odukoya O. Ultrasound-guided supraclavicular brachial plexus block. Anesthesia & Analgesia. 2003 Nov 1;97(5):1514-7.

7. Ahuja K, Dureja J, Chaudhary G, Middha S. A comparative evaluation of techniques in interscalene brachial plexus block: conventional blind, nerve stimulator guided, and ultrasound guided.

8. Gray AT. Miller's Anesthesia. 7th ed. Elsevier: Churchill Livingstone; 2010. p. 1676-80.

9. Morros C, Perez-Cuenca MD, Sala-Blanch X, Cedó F. Ultrasound-guided axillary brachial plexus block: learning curve and results. Revista Española de Anestesiología y Reanimación. 2011 Feb 1;58(2):74-9.

10. Williams SR, Chouinard P, Arcand G, Harris P, Ruel M, Boudreault D, Girard F. Ultrasound guidance speeds execution and improves the quality of supraclavicular block. Anesthesia & Analgesia. 2003 Nov 1;97(5):1518-23.

11. Honnannavar KA, Mudakanagoudar MS. Comparison between conventional and ultrasound-guided supraclavicular brachial plexus block in upper limb surgeries. Anesthesia Essays and Researches. 2017 Apr 1;11(2):467-71.

12. Duncan M, Shetti AN, Tripathy DK, Roshansingh D, Krishnaveni N. A comparative study of nerve stimulator versus ultrasound-guided supraclavicular brachial plexus block. Anesthesia Essays and Researches. 2013 Sep 1;7(3):359-64.

13. Singh S, Goyal R, Upadhyay KK, Sethi N, Sharma RM, Sharma A. An evaluation of brachial plexus block using a nerve stimulator versus ultrasound guidance: A randomized controlled trial. Journal of Anaesthesiology Clinical Pharmacology. 2015 Jul 1;31(3):370-4.

14. Shilpashri AM, Chikkanagoudar S. Comparison of landmark technique versus ultrasound-guided technique for supraclavicular brachial plexus block in upper limb surgeries: A prospective randomized trial. Indian Journal of Clinical Anesthesia. 2023;10(3):242-7.

15. Dureja J, Siwach RC, Singh J, Chaudhry G, Bansal P. Comparative evaluation of techniques in supraclavicular brachial plexus block: Conventional blind, nerve stimulator guided, and ultrasound guided. International Journal of Scientific Study. 2015;2(12):125-8.

16. Marhofer P, Chan VW. Ultrasound-guided regional anesthesia: current concepts and future trends. Anesthesia & Analgesia. 2007 May 1;104(5):1265-9.

17. Raghove P, Singh K, Taxak S, Ahlawat M, Hooda S. Comparison of ultrasound-guided technique with conventional landmark technique for supraclavicular brachial plexus nerve block in patients undergoing upper limb surgery. International Journal of Pharmacology and Clinical Sciences. 2016;5(1).

18. Veeresham M, Goud U, Surender P, Kumar P. Comparison between conventional technique and ultrasound-guided supraclavicular brachial plexus block in upper limb surgeries. Journal of Evolution of Medical and Dental Sciences. 2015 May 7;4(37):6465-77.

19. Kapral S, Greher M, Huber G, Willschke H, Kettner S, Kdolsky R, Marhofer P. Ultrasonographic guidance improves the success rate of interscalene brachial plexus blockade. Regional Anesthesia & Pain Medicine. 2008 Apr 1;33(3):253-8.

Original Article

Prevalence of Refractive Errors among School Going Children in Khulna City

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Abstract

Background: Refractive error is a major contributor of visual impairment and second leading cause of treatable blindness causing significant morbidity in children worldwide. School age children constitute a particularly vulnerable group, because uncorrected refractive error may have a dramatic impact on learning capability and educational potential. Untreated Refractive Error can cause amblyopia and poor school performance, which in long-run can lead to financial and social loss. **Materials & Methods:** We did a cross-sectional observational study on 466 children in the department of Ophthalmology of Khulna Medical Hospital, Khulna to find out the prevalence of refractive errors among them. School going children of 5-15 years of both sexes were our study subjects. **Results:** We found that, 14.6% of our study subjects had refractive errors. Among them, 176 (37.8%) were in the 11-15 years age group with a male preponderance of male (52.8%). Positive family history was also found in subjects with refractive error. **Conclusion:** Prevalence of refractive error (RE) among school going children was 14.4% with slight male preponderance. RE increases with increasing age and RE has significant positive family history. Refractive error is not uncommon in school going children and therefore, they should be carefully screened and followed up.

Keywords: Refractive error, school going children.

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Introduction

Refractive error (RE) is a major contributor of visual impairment in not only adults but also school going children. If uncorrected, refractive error may have a dramatic impact on learning capability [1, 2]. The latest global estimates of visual impairment suggest that an estimated 2.3 billion people worldwide have RE and among children of 5-15 years, 12.8 million were visually impaired due to refractive errors representing a prevalence of 0.97% with higher prevalence reported in China and urban areas of Southeast Asia [3-5]. Data regarding prevalence of RE among school children in Bangladesh is scarce due to lack of studies, as most of the children with uncorrected refractive error are asymptomatic and only those whose disabilities are so severe as to be noticed by the parent or the teacher are brought to an ophthalmologist and a major portion of this patient group are unattended to ophthalmologist [2].

Refractive error is an optical defect in which rays of light from optical infinity fail to converge on the fovea in the non-accommodating eye and examples include myopia, hyperopia, astigmatism [5]. Myopia occurs when the eyeball is too long, relative to the focusing power of the cornea and lens of the eye or because of the cornea/lens being too curved. In hyperopia, the image of a nearby object is formed behind the retina when eye is too short, or cornea/lens does not refract the light enough. Astigmatism is a defect in the eye

or in lens caused by a deviation from spherical curvature resulting in distorted images [6].

It has been reported that female children had higher risk of myopia than hyperopia. Association of refractive errors with socio demographic variables showed that the prevalence of myopia and astigmatism significantly increased with age and number of years of schooling. Onset of the myopia commonly starts from the primary school children aged between 8 and 12 years. It is typically progressing until the age of twenty due to continuation of eye growth [7]. Whereas the prevalence of hyperopia was found to be significantly higher in the younger age group of 7-9 years [8]. In a systemic review and meta-analysis among school children aged ≤ 15 years in India by Sheeladevi S et al. reported that overall prevalence of RE was 8 %, while myopia, hyperopia and astigmatism accounted for 5.3%, 4% and 5.4% respectively [9].

Diagnosis and treatment of refractive error is relatively simple and is one of the easiest ways to reduce impaired vision. Early detection of vision problems can have educational, behavioral, and quality of life benefits. Correction of refractive errors and low vision is one of the priorities of global initiatives for vision 2020. In Bangladesh, lack of appropriate child eye care strategies has posed a serious problem to the visual health of children. As significant portion of children in Bangladesh suffer from refractive errors; hence a more complete assessment with population-based studies was undertaken.

Materials & Methods

We did a cross-sectional observational study on 466 school going children in Khulna city of Bangladesh by simple random sampling between the periods of January 2019 to July 2019. School going children of both sexes with age range between 5 to 15 years who were willing to participate were our study subjects. We excluded the students with ocular pathology including strabismus, corneal opacity, cataract, glaucoma and retinopathy. We also excluded students with previous ocular surgery. Informed consent was taken from every child's parents. Data was collected in a preformed data collection sheet and analyzed thoroughly with Microsoft excel 2013. A p value of <0.05 was considered as significant.

Results

Table I shows the distribution of the study subjects by age. Distribution of the respondents with refractive error according to their socio-demographic profile was shown in table II. Figure 1 shows the gender distribution of the respondents while figure 2 shows distribution of the respondents by refractive error.

Table I: Distribution of the respondents by Age (n=466).

Age group (years)	Frequency n (%)	Mean ± SD
5 - <6	161 (34.5)	8.60±3.67
6 -10	129 (27.7)	
11 - 15	176 (37.8)	
Total	**466 (100)**	

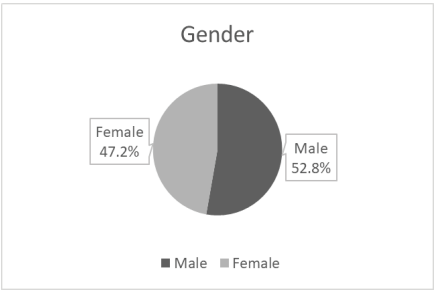

Figure 1: Distribution of the respondents by Gender (n=466).

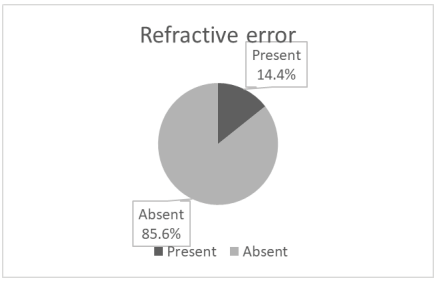

Figure 2: Distribution of the respondents by Refractive error (n=466).

Table II: Distribution of the respondents with Refractive error according to their socio-demographic profile in (n=466).

	Refractive error Frequency n (%)	No Refractive error Frequency n (%)	P value
Age			
≥ 5 years	11 (16.4)	150 (37.6)	***<0.01**
6 to 10 years	17 (25.4)	112 (28.1)	
11 to 15 years	39 (58.2)	137 (34.3)	
Sex			
Male	35 (52.2)	211 (52.9)	0.922
Female	32 (47.8)	188 (47.1)	
Religion			
Islam	64 (95.5)	377 (94.5)	0.712
Hindu	3 (4.5)	18 (4.5)	
Buddhist	-	4 (1)	
Educational status			
Play group to class 1	23 (34.3)	235 (58.9)	***0.02**
Class 2 to 4	6 (9)	27 (6.8)	
Class 5 to 7	16 (23.9)	70 (17.5)	
Class 8 to 10	22 (32.8)	67 (16.8)	
Food Habit			
Non-Vegetarian	55 (82.1)	322 (80.7)	0.518
Vegetarian	12 (17.9)	77 (19.3)	
Family history			
Present	15 (22.4)	49 (12.3)	***0.002**
Absent	52 (77.6)	350 (87.7)	

Discussion

Refractive error is one of the common causes of visual impairment and it is quite common among the children. Children who have the refractive errors if may not corrected at younger age may suffer in their subsequent life. School going children constitute a large portion of the country population, so uncorrected refractive errors may create a social problem also. Though diagnosis and treatment of refractive error is relatively simple but, in many cases, it is neglected. Early detection of vision problems can have educational, behavioral, and quality of life benefits. Correction of refractive errors and low vision is one of the priorities of global initiatives for vision 2020. This study is undertaken to find out the frequency of refractive error among school students attended the ophthalmologist in Khulna City. Total number of students was 466 collected by simple random sampling.

In this study 37.8% respondents were aged between 11 to 15 years, 34.5% were 5 years and 27.7% were aged between 6 to 10 years (table I). Mean age of the respondents was 8.60 ± 3.67 years of SD. In the study of Vidusha et al. (2018) among 1140 respondents mean age was 11.28 years of SD [10]. In this study majority (52.8%) of the respondents were male and 47.2% female (figure 1). Niroula et al. (2009) also found male predominance with 50.8% [11].

We found refractive error in 14.4% of the study subjects (figure 2). Vidusha found 10.4% refractive error in her study in 2018 [12]. Niroula et al. (2009) found 6.4% refractive error in his study [11].

We found significant refractive error with increasing age. Refractive error was also significant with advancement of study class. We also found significant positive family history of refractive error among the study subjects with refractive errors (table II). In the study of Pavithra et al. (2013) also found that family history was significantly associated with the prevalence of refractive error [3]. Vidusha et al. (2012) also observed positive family history of refractive errors but it was not statistically significant [12].

Conclusion

From the above study it could be concluded that, prevalence of refractive error (RE) among school going children was 14.4% with slight male preponderance. RE increases with increasing age and RE has significant positive family history.

References

1. Elkot Wgdy, Hegazy FM, Hamouda NN, Asmhan F. Prevalence of refractive errors among primary school children in the rural areas of Menouf district, Egypt. Menoufia Med J . 2016;29(4):1044–7.

2. Shakeel T. Pattern of Refractive Errors in Primary School Children in Dehradun City of Uttrakhand State. Delhi J Ophthalmol.

2016;27(2):106–10.
3. Pavithra, R,. A study on the prevalence of refractive errors among school childern of 7-15 years age group in the field practice areas of a medical college in bangalore. Int J Med Sci Public Heal. 2013;2(3):1-117.
4. Elmajri KA. A Survey of the Prevalence of Refractive Errors among Children in Lower Primary Schools in Darnah City, Libya. Adv Ophthalmol Vis Syst. 2017;7(5):1–7.
5. UrRehman M, Ahmad S, Syed M. Refractive errors among school-going children in Hyderabad. Int J Med Sci Public Heal. 2017;6(4):703-17.
6. McCarty CA. Uncorrected refractive error. Br J Ophthalmol. 2006;90(5):521–2.
7. Mohammed Alemam A, Aldebasi MH, Rehmatullah A, Alsaidi R, Tashkandi I. Prevalence of myopia among children attending pediatrics ophthalmology clinic at ohud hospital, Medina, Saudi Arabia. J Ophthalmol. 2018;(18):1-8.
8. Sethi MJ, Sethi S, Iqbal R, Hospital KT. Frequency of Refractive Errors in Children Visiting Eye Out Patient Department Agency. 2009;7(2):114–7.
9. Sheeladevi S, Seelam B, Nukella PB, Modi A, Ali R, Keay L. Prevalence of refractive errors in children in India: a systematic review. Clin Exp Optom. 2018;101(4):495–503.
10. Vidusha KSS. Prevalence of refractive errors among school children in the rural field practice area of a tertiary care hospital, Bengaluru. Int J Community Med Public Heal. 2018;5(4):441-5.
11. Niroula DR, Saha CG. Study on the refractive errors of school going children of Pokhara city in Nepal. Kathmandu Univ Med J. 2009;7(25):67–72.
12. Vidusha KSS. Prevalence of refractive errors among school children in the rural field practice area of a tertiary care hospital, Bengaluru. Int J Community Med Public Heal. 2018;5(4):441-5.

Original Article

Correlation of Clinical, Hormonal, Biochemical and Ultrasound Parameters Between Adult and Adolescent Polycystic Ovarian Syndrome: A Study of 100 Cases

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Abstract

Background: Polycystic Ovarian Syndrome (PCOS) is the most common endocrine disorder among females of reproductive age, with onset frequently occurring during adolescence. Diagnostic challenges arise due to physiological pubertal changes that overlap with PCOS features. Comparative evaluation of clinical, hormonal, biochemical, and ultrasonographic parameters between adolescents and adults may improve understanding of disease expression across age groups. **Objectives:** To compare and correlate clinical features, hormonal profiles, biochemical parameters, and ultrasound findings in adolescent and adult patients diagnosed with PCOS. **Methods:** A hospital-based cross-sectional observational study was conducted on 100 patients diagnosed with PCOS according to the Rotterdam criteria. Participants were divided into two groups: adolescents (13–19 years; n=50) and adults (20–35 years; n=50). Clinical, anthropometric, hormonal, biochemical, and ultrasonographic data were collected and analyzed. Correlation and comparative statistics were applied. **Results:** Menstrual irregularity and hyperandrogenic features were more prevalent in adolescents, whereas obesity, insulin resistance, and metabolic abnormalities were significantly higher in adults. Serum LH/FSH ratio and androgen levels were elevated in both groups but showed stronger correlation with ovarian volume and follicle count in adults. Ultrasound findings were less definitive in adolescents. **Conclusion:** PCOS manifests differently across age groups. Adolescents predominantly present with reproductive and hyperandrogenic symptoms, while adults show greater metabolic derangements. Age-specific diagnostic and management strategies are essential.

Keywords: Polycystic ovarian syndrome, Adolescents, Adults, Hormonal profile, Ultrasound, Metabolic parameters

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Introduction

Polycystic Ovarian Syndrome (PCOS) is one of the most common endocrine disorders affecting females of reproductive age, with a prevalence ranging from 6% to 20% depending on the diagnostic criteria used [1]. It is a complex, heterogeneous disorder characterized by menstrual dysfunction, clinical and/or biochemical hyperandrogenism, and polycystic ovarian morphology on ultrasonography. Beyond reproductive implications, PCOS is increasingly recognized as a multisystem disorder with significant metabolic, cardiovascular, and psychological consequences.

The onset of PCOS often occurs during adolescence, soon after menarche. However, diagnosing PCOS in adolescents remains challenging due to the overlap between normal pubertal physiological changes and features of PCOS. Irregular menstrual cycles, acne, and multifollicular ovarian appearance are common during normal puberty, making it difficult to distinguish pathological conditions from normal developmental variations [2]. As a result, underdiagnosis or overdiagnosis is common in this age group, leading either to delayed intervention or unnecessary anxiety and treatment.

In adults, PCOS tends to manifest more clearly, with established reproductive and metabolic abnormalities. Adult women with PCOS frequently present with obesity, insulin resistance, dyslipidemia, impaired glucose tolerance, and an increased risk of type 2 diabetes mellitus and cardiovascular disease [3]. The chronic nature of hyperinsulinemia and hyperandrogenism contributes to long-term health risks, emphasizing the importance of early identification and continuous monitoring.

Hormonal abnormalities play a central role in the pathophysiology of PCOS. Increased luteinizing hormone (LH) secretion with relatively normal or low follicle-stimulating hormone (FSH) levels results in an elevated LH/FSH ratio, promoting ovarian androgen production and follicular arrest [4]. Hyperandrogenism, either clinical or biochemical, is a key diagnostic feature and is responsible for manifestations such as hirsutism, acne, and alopecia. Insulin resistance further exacerbates hyperandrogenism by stimulating ovarian androgen synthesis and reducing sex hormone–binding globulin levels [5].

Ultrasonography remains an important diagnostic tool for PCOS, particularly in adults. Polycystic ovarian morphology is characterized by increased ovarian volume and multiple small follicles arranged peripherally. However, its diagnostic value in adolescents is limited, as similar findings may be seen in normal pubertal development [6]. Consequently, recent international guidelines recommend caution in the use of ultrasound as a diagnostic criterion in adolescents.

Given the age-related variability in clinical presentation and disease progression, comparative evaluation of PCOS parameters between adolescents and adults is essential. Understanding these differences can facilitate age-appropriate diagnostic strategies and early interventions aimed at preventing long-term metabolic and reproductive complications. This study was therefore undertaken to correlate and compare clinical, hormonal, biochemical, and ultrasonographic parameters between adolescent and adult patients with PCOS.

Aims and Objectives

Primary Aim

- To study the correlation of clinical, hormonal, biochemical, and ultrasound parameters in adolescent and adult PCOS patients.

Secondary Objectives

- To compare clinical features such as menstrual irregularity, hirsutism, acne, and obesity between adolescents and adults.

- To evaluate and compare hormonal profiles including LH, FSH, LH/FSH ratio, total testosterone, and prolactin.
- To assess biochemical parameters including fasting glucose, fasting insulin, lipid profile, and insulin resistance (HOMA-IR).
- To analyze ultrasonographic features of ovaries and correlate them with hormonal and metabolic parameters.

Materials and Methods

We did a cross-sectional observational study on 100 cases between the periods of January 2024 to July 2025. Patients who came for doing ultrasonography in Satkhira Medical College Hospital (SMCH), Satkhira and diagnosed as PCOS, were included in our study based on the following inclusion and exclusion criteria. We also grouped the patients in the following manner.

Study Groups

- Group A (Adolescents): 50 patients aged 13–19 years
- Group B (Adults): 50 patients aged 20–35 years

Inclusion Criteria

- Females diagnosed with PCOS based on Rotterdam criteria (any two of the following):
  1. Oligo/anovulation
  2. Clinical or biochemical hyperandrogenism
  3. Polycystic ovaries on ultrasound
- Adolescents at least two years post-menarche

Exclusion Criteria

- Thyroid disorders
- Hyperprolactinemia
- Congenital adrenal hyperplasia
- Androgen-secreting tumors
- Cushing's syndrome
- Patients on hormonal treatment in the last three months

Data Collection

Clinical Assessment

- Detailed menstrual history
- Assessment of hirsutism using modified Ferriman–Gallwey (mFG) score
- Presence of acne and alopecia
- Anthropometric measurements: height, weight, BMI, waist circumference

Hormonal Parameters

- Serum LH
- Serum FSH
- LH/FSH ratio
- Total testosterone
- Prolactin
- TSH (to exclude thyroid dysfunction)

Samples were collected in the early follicular phase or randomly in amenorrheic patients.

Biochemical Parameters

- Fasting blood glucose
- Fasting serum insulin
- HOMA-IR calculation
- Lipid profile: total cholesterol, triglycerides, HDL, LDL

Ultrasonography

- Transabdominal ultrasound for adolescents and transvaginal ultrasound for adults (where appropriate)
- Ovarian volume
- Follicle number per ovary (2–9 mm)
- Stromal echogenicity

Statistical Analysis

Data were analyzed using statistical software. Continuous variables were expressed as mean ± SD, and categorical variables as percentages. Student's t-test and chi-square test were used for comparison. Pearson correlation coefficient was applied to assess correlations. A p-value <0.05 was considered statistically significant.

Results

A total of 100 patients diagnosed with polycystic ovarian syndrome were included in the study, comprising 50 adolescents and 50

adults. The results are presented as a comparative analysis of clinical, anthropometric, hormonal, biochemical, and ultrasonographic parameters between the two groups, followed by correlation analysis.

Demographic Characteristics

The mean age of adolescents was 16.8 ± 1.9 years, while that of adults was 26.4 ± 4.2 years (Table 1). This ensured a clear age demarcation between the two study groups and allowed for meaningful comparison of age-related variations in PCOS manifestations.

Clinical Profile

Menstrual irregularities were the most common presenting complaint in both groups but were significantly more frequent among adolescents (88%) compared to adults (76%). This finding reflects the predominance of ovulatory dysfunction during the early years following menarche. Acne was observed in 68% of adolescents, significantly higher than in adults (44%), indicating increased cutaneous sensitivity to androgens during puberty.

Hirsutism, assessed using the modified Ferriman–Gallwey score, was more prevalent in adults (72%) than adolescents (60%), suggesting a cumulative effect of prolonged hyperandrogenism. Androgenic alopecia was also significantly higher among adults (28%) compared to adolescents (12%). Obesity was markedly more common in adults (64%) than adolescents (36%), highlighting the progressive nature of weight gain and metabolic risk with advancing age and disease duration (Table 2).

Anthropometric Parameters

Adults demonstrated significantly higher mean body mass index and waist circumference compared to adolescents. The mean BMI in adults was 26.8 ± 4.1 kg/m², whereas adolescents had a mean BMI of 23.1 ± 3.2 kg/m². Similarly, waist circumference was significantly greater in adults (88.2 ± 7.4 cm) than adolescents (78.4 ± 6.5 cm), indicating increased central adiposity in adult PCOS patients (Table 3).

Hormonal Profile

Hormonal evaluation revealed elevated serum LH levels in both groups, with adults showing significantly higher mean LH levels compared to adolescents. Serum FSH levels were relatively lower in adults, resulting in a significantly higher LH/FSH ratio in adults (2.4 ± 0.7) compared to adolescents (1.9 ± 0.6). Total testosterone levels were elevated in both groups but were significantly higher among adults. These findings indicate more pronounced neuroendocrine and hyperandrogenic disturbances in adult PCOS patients (Table 4).

Biochemical and Metabolic Parameters

Adults exhibited significantly higher fasting blood glucose and fasting insulin levels compared to adolescents. Insulin resistance, assessed by HOMA-IR, was markedly higher in adults (4.5 ± 1.2) than adolescents (2.7 ± 0.8). Lipid profile analysis revealed significantly elevated triglyceride levels and reduced HDL cholesterol levels in adults, reflecting a higher prevalence of dyslipidemia and metabolic syndrome components in this group (Table 5).

Ultrasonographic Findings

Polycystic ovarian morphology was observed in 68% of adolescents and 86% of adults. Mean ovarian volume and follicle count per ovary were significantly higher in adults. Adolescents showed more variable ultrasonographic findings, possibly reflecting physiological multifollicular ovaries during puberty. These results suggest that ultrasound criteria are more reliable for diagnosing PCOS in adults than adolescents (Table 6).

Correlation Analysis

Correlation analysis demonstrated a significant positive correlation between LH/FSH ratio and ovarian volume in adults ($r = 0.52$, $p < 0.05$), whereas the correlation was weaker in adolescents. Total testosterone levels showed a positive correlation with hirsutism scores in both groups, with a stronger association in adults ($r = 0.61$). BMI demonstrated a significant positive correlation with HOMA-IR in both adolescents and adults, more pronounced in adults, indicating increasing insulin resistance with higher adiposity and advancing age (Table 7).

Overall, the results indicate that adolescents with PCOS predominantly exhibit reproductive and hyperandrogenic features, while adults demonstrate more severe metabolic and ultrasonographic abnormalities, reflecting disease progression over time.

Table I: Age Distribution of Study Population.

Age Group	Adolescents (n=50)	Adults (n=50)
Mean age (years)	16.8 ± 1.9	26.4 ± 4.2

Table II: Comparison of Clinical Features.

Clinical Feature	Adolescents n (%)	Adults n (%)	p-value
Menstrual irregularity	44 (88%)	38 (76%)	0.04
Hirsutism (mFG ≥8)	30 (60%)	36 (72%)	0.03
Acne	34 (68%)	22 (44%)	0.01
Alopecia	6 (12%)	14 (28%)	0.02
Obesity (BMI ≥25 kg/m²)	18 (36%)	32 (64%)	<0.01

Table III: Anthropometric Parameters.

Parameter	Adolescents (Mean ± SD)	Adults (Mean ± SD)	p-value
BMI (kg/m²)	23.1 ± 3.2	26.8 ± 4.1	<0.001
Waist circumference (cm)	78.4 ± 6.5	88.2 ± 7.4	<0.001

Table IV: Hormonal Profile Comparison.

Hormonal Parameter	Adolescents (Mean ± SD)	Adults (Mean ± SD)	p-value
LH (IU/L)	10.6 ± 3.2	12.4 ± 3.8	0.01
FSH (IU/L)	5.8 ± 1.4	5.2 ± 1.3	0.04
LH/FSH ratio	1.9 ± 0.6	2.4 ± 0.7	<0.001
Total Testosterone (ng/dL)	62.3 ± 14.6	71.8 ± 16.2	0.002

Table V: Biochemical and Metabolic Parameters.

Parameter	Adolescents (Mean ± SD)	Adults (Mean ± SD)	p-value
Fasting glucose (mg/dL)	88.4 ± 7.6	96.8 ± 9.2	<0.001
Fasting insulin (µIU/mL)	12.6 ± 4.1	18.9 ± 6.3	<0.001
HOMA-IR	2.7 ± 0.8	4.5 ± 1.2	<0.001
Triglycerides (mg/dL)	118.2 ± 28.4	156.6 ± 36.8	<0.001
HDL (mg/dL)	46.8 ± 6.2	38.4 ± 5.8	<0.001

Table VI: Ultrasonographic Findings

Ultrasound Parameter	Adolescents	Adults	p-value
Polycystic ovaries (%)	68%	86%	0.02
Mean ovarian volume (cm³)	9.8 ± 2.1	12.6 ± 2.8	<0.001
Mean follicle count	14.2 ± 3.6	18.8 ± 4.2	<0.001

Table VII: Correlation Analysis of Key Parameters.

Parameters Correlated	Adolescents (r)	Adults (r)
LH/FSH ratio vs Ovarian volume	0.28	0.52*
Testosterone vs mFG score	0.34	0.61*
BMI vs HOMA-IR	0.42*	0.68*

Discussion

The present study highlights significant age-related differences in the clinical, hormonal, biochemical, and ultrasonographic manifestations of polycystic ovarian syndrome. By comparing adolescents and adults with PCOS, this study underscores the dynamic nature of the disorder and its progression over time.

Menstrual irregularities were more prevalent among adolescents, reflecting the immaturity of the hypothalamic–pituitary–ovarian axis during the early post-menarcheal years. Similar findings have been reported by Ibáñez et al., who emphasized that ovulatory dysfunction is often the earliest manifestation of PCOS in adolescents [7]. Acne was also significantly more common in adolescents, consistent with the increased sensitivity of pilosebaceous units to androgens during puberty. In contrast, adults demonstrated a higher prevalence of hirsutism and alopecia, indicating prolonged exposure to hyperandrogenism and its cumulative effects on hair follicles.

Obesity and central adiposity were significantly more common in adults than adolescents in this study. This observation aligns with previous studies showing that weight gain and fat redistribution increase with age and disease duration in PCOS [8]. Increased adiposity plays a pivotal role in worsening insulin resistance, thereby amplifying both metabolic and reproductive abnormalities.

Hormonal analysis revealed elevated LH levels and increased LH/FSH ratios in both groups, with significantly higher values in adults. This finding supports the classical neuroendocrine dysfunction associated with PCOS, characterized by increased GnRH pulse frequency favoring LH secretion [9]. Total testosterone levels were elevated in both adolescents and adults; however, the stronger correlation between testosterone levels and hirsutism scores in adults suggests a longer duration of androgen exposure leading to more pronounced clinical manifestations.

Metabolic abnormalities were markedly higher in adults. Elevated fasting insulin levels and higher HOMA-IR values in adults indicate significant insulin resistance, which is known to worsen with age and obesity in PCOS patients [10]. Dyslipidemia, characterized by elevated triglycerides and reduced HDL cholesterol, was also more common in adults, increasing their long-term cardiovascular risk. These findings reinforce the concept of PCOS as a metabolic disorder with progressive severity if left untreated.

Ultrasonographic evaluation showed a higher prevalence of polycystic ovarian morphology, increased ovarian volume, and higher follicle counts in adults compared to adolescents. The weaker correlation between ultrasound findings and hormonal parameters in adolescents supports current guideline recommendations that ultrasound should not be used as a mandatory diagnostic criterion in this age group [6]. In adults, however, ovarian morphology correlated significantly with LH/FSH ratio, highlighting its diagnostic utility.

Overall, the findings of this study emphasize that PCOS evolves from predominantly reproductive and hyperandrogenic manifestations in adolescence to more pronounced metabolic complications in adulthood. Early diagnosis during adolescence provides a crucial opportunity for lifestyle modification and targeted interventions aimed at reducing long-term morbidity. Age-specific diagnostic criteria and management strategies are therefore essential to optimize outcomes in patients with PCOS.

Limitations

- Cross-sectional design limits causal inference
- Relatively small sample size
- Single-center study
- Use of transabdominal ultrasound in adolescents may underestimate ovarian morphology

Conclusion

PCOS exhibits age-dependent variations in clinical, hormonal, biochemical, and ultrasound parameters. Adolescents mainly exhibit reproductive and hyperandrogenic features, whereas adults show significant metabolic derangements. Diagnostic and management approaches should be tailored according to age to improve outcomes and prevent long-term complications.

Recommendations

- Age-specific diagnostic criteria for adolescents
- Emphasis on lifestyle modification from early diagnosis
- Regular metabolic screening in adult PCOS patients

References

1. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril. 2004;81(1):19–25.

2. Hickey M, Doherty DA, Atkinson H, Sloboda DM, Franks S, Norman RJ, Hart R. Clinical, ultrasound and biochemical features of polycystic ovary syndrome in adolescents: implications for diagnosis. Hum Reprod. 2011;26(6):1469–1477.

3. Azziz R, Woods KS, Reyna R, Key TJ, Knochen-

hauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. J Clin Endocrinol Metab. 2004;89(6):2745–2749.

4. Yen SSC. The polycystic ovary syndrome. Clin Endocrinol (Oxf). 1980;12(2):177–208.

5. Dunaif A. Insulin resistance and the polycystic ovary syndrome: mechanism and implications for pathogenesis. Endocr Rev. 1997;18(6):774–800.

6. Teede HJ, Misso ML, Costello MF, et al. International evidence-based guideline for the assessment and management of polycystic ovary syndrome. Hum Reprod. 2018;33(9):1602–1618.

7. Ibáñez L, Oberfield SE, Witchel S, et al. An International Consortium Update: Pathophysiology, diagnosis, and treatment of polycystic ovarian syndrome in adolescence. Horm Res Paediatr. 2017;88(6):371–395.

8. Gambineri A, Pelusi C, Vicennati V, Pagotto U, Pasquali R. Obesity and the polycystic ovary syndrome. Int J Obes Relat Metab Disord. 2002;26(7):883–896.

9. Franks S. Polycystic ovary syndrome. N Engl J Med. 1995;333(13):853–861.

10. Legro RS, Kunselman AR, Dodson WC, Dunaif A. Prevalence and predictors of risk for type 2 diabetes mellitus and impaired glucose tolerance in polycystic ovary syndrome. J Clin Endocrinol Metab. 1999;84(1):165–169.

Original Article

Pattern of Surgical and Urological Emergencies in SMCH

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Abstract

Background: In resource-limited settings like ours, the rising number of surgical emergencies places significant strain on hospital resources, particularly in the emergency department. Understanding the burden and distribution of these cases is essential for planning and optimizing services. As surgical emergencies constitute a major proportion of a surgeon's workload, evaluating their patterns can guide strategies for improving patient care. This study aimed to assess the pattern of surgical emergencies presenting to our center. **Methods:** We conducted a two-year retrospective study of all emergencies surgical and urological admissions at Satkhira Medical College Hospital from August 2023 to November 2025. **Results:** A total of 613 surgical emergency operations were performed during the study period. The 41–60-year age group accounted for the largest proportion of cases (36.5%). There were 353 males and 260 females, giving a male-to-female ratio of 1.35:1. Among all patients, acute appendicitis (13.5%), hollow viscus perforation (5.7%), and intestinal obstruction (5.2%) were the leading diagnoses. Exploratory laparotomy was the most frequently performed procedure, followed by appendectomy. The mean hospital stay was 6.6 days. The most common postoperative complications were surgical site infection (33.9%) and wound dehiscence (13.6%). The overall mortality rate was 8.33%, with septicemia being the predominant cause of death. Most patients belonged to the low socioeconomic group. **Conclusion:** Our study shows a broad range of surgical emergencies, with trauma forming a significant share of the caseload. Strengthening trauma management, neurosurgical support, and intensive care services could enhance patient outcomes. Early diagnosis, prompt resuscitation, and timely definitive surgery remain crucial to reducing mortality in emergency surgical patients.

Keywords: Surgical emergencies; Pattern; Satkhira medical college hospital (SMCH).

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Introduction

Surgical conditions form a major part of the global disease burden, and many present as life- or limb-threatening emergencies [1]. Emergency surgeries account for more than half of surgical admissions in many regions [2], and their numbers continue to increase [3, 4]. Emergency surgery deals with acute threats to life, organs, or limbs, often requiring operative intervention within 24 hours [5]. Surgeons managing these cases must understand acute pathophysiology, associated comorbidities, and rapid patient optimization [6]. Common general surgical emergencies include acute

appendicitis, intestinal obstruction, incarcerated hernias, hollow viscus perforation, trauma, and soft-tissue infections [7-9]. While trauma—especially road traffic injuries, burns, falls, and penetrating wounds—remains a leading cause of emergency admissions, non-traumatic conditions such as appendicitis, intestinal obstruction, and urinary retention are also frequent [10-11]. Patterns of emergencies vary with geography, socioeconomic status, and environmental factors. There is limited data from our setting on the burden and pattern of surgical emergencies. Understanding these trends is essential for better planning, resource allocation, and improving patient outcomes. This study aims to describe the spectrum and presentation of surgical emergencies in our environment.

Methods

This retrospective study reviewed all emergency surgical admissions to the Surgery and Urology departments of Satkhira Medical College Hospital (SMCH) from August 2023 to November 2025. SMCH is a 500-bed facility with four operating theatres and an eight-bed ICU, serving a population of more than two million. The study included emergency admissions from general surgery, urology, neurosurgery, and plastic surgery. Obstetric and gynecological emergencies were excluded. Patients were first assessed and resuscitated in the emergency department. Minor cases were managed in the emergency theatre and discharged directly, while others were admitted for operative or non-operative management. All patients were followed up for at least one year in the surgical outpatient clinic. Data were collected using a structured questionnaire and patient records, including demographics, diagnosis, cause of illness or injury, symptom duration or injury-arrival interval, comorbidities, treatment provided, hospital stay, and treatment outcomes.

Inclusion criteria:

Patients aged 13 years and above of any gender who presented with clinical or radiological evidence of a general surgical emergency and required operative management were included.

Exclusion criteria:

Patients younger than 13 years, those who declined participation, cases managed conservatively, patients refusing surgery and leaving against medical advice, and emergency cases from neurosurgery, orthopedics, and pediatric surgery were excluded. On admission, demographic details, symptom onset and progression, comorbidities, and previous surgical history were documented. After clinical assessment and relevant laboratory and imaging studies, patients underwent emergency surgery following informed consent. Perioperative data, including anesthesia type, intraoperative events, and hospital stay—were recorded. Postoperative complications, follow-up outcomes, and any mortality were documented. All information was compiled in Microsoft Excel and analyzed using appropriate statistical methods.

Results

Out of total 613 patients studied 353 were males and 260 were females. The male to female ratio was 1.35:1. (Figure 1).

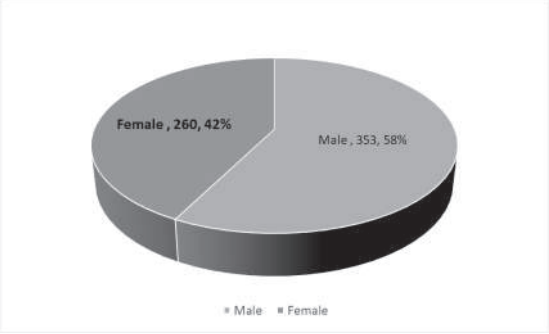

Figure 1: Sex- wise distribution of case of emergency surgeries.

Majority of patients were from 41 to 60 years age group (36.5%) followed by 21-40 years age group (34.7%). 15.5% patients were from 61-80 years age group.

Table 1: Distribution of patients according to age group.

Age group (years)	Frequency n (%)
13-20	45 (7.3)
21-40	213 (34.7)
41-60	224 (36.5)
61-80	95 (15.5)
>80	36 (5.9)
Total	613 (100)

A total of 613 patients presented with various surgical emergencies. Appendicitis was the most common diagnosis, accounting for 13.5%, followed by diabetic foot infections (10.8%), and procedures requiring chest drain insertion (11.7%). Other frequently encountered conditions included suprapubic catheterization issues (6.2%), burn injuries (5.9%), hollow viscus perforation (5.7%), and intestinal obstruction (5.2%). Abscesses (4.1%), difficult catheterization (4.1%), peripheral vascular disease (4.7%), obstructed hernias (3.6%), and head injuries (3.6%) also contributed notably to the workload. Less common presentations were Fournier's gangrene (3.1%), blunt abdominal trauma (3.1%), non-viable testis (1.0%), compartment syndrome (1.6%), and bleeding hemorrhoids (0.8%). Rare diagnoses included rectal prolapse, perineal abscess, psoas abscess, and ruptured ectopic pregnancy. This distribution highlights the broad spectrum of surgical emergencies managed in our hospital. (Table 2).

A wide range of emergency surgical procedures were performed during the study period. Exploratory laparotomy was the most frequently conducted operation (92 cases), followed by appendectomy (83 cases). Procedures related to urinary tract emergencies were also common, including suprapubic catheterization (SPC) (38 cases) and difficult catheterization (25 cases). Management of diabetic foot complications accounted for 66 procedures, while chest drain insertion was performed in 72 patients. Other frequently performed interventions included incision and drainage of abscesses (38 cases), fasciectomy

Table 2: Distribution of surgical emergencies.

Surgical emergency	Frequency n (%)
Appendicitis	13.5
Burst Appendix	1.5
Cellulitis/Fournier's gangrene	3.1
Abscess	4.1
Infected / Fungating Breast Mass	2
Obstructed Hernia	3
Non-Viable Testis	1
PVD	4.7
Compartment Syndrome	1.6
Anal Fissure	0.8
Blunt Trauma Abdomen	3.1
Hollow Viscus Perforation	5.7
Rectal Prolapse	0.5
Bleeding Hemorrhoid	0.8
Inguinal Abscess	0.8
Diabetic Foot	10.8
Ruptured Ectopic Pregnancy	0.2
Psoas Abscess	0.8
Chest Drain	11.7
Perineal Abscess	0.5
Intestinal Obstruction	5.2
SPC	6.2
Circumcision	1.8
Penile Injury	0.8
Clot Retention	1.6
Difficult Catheterization	4.1
Head Injury	3.6
Burn	5.9
Total	100

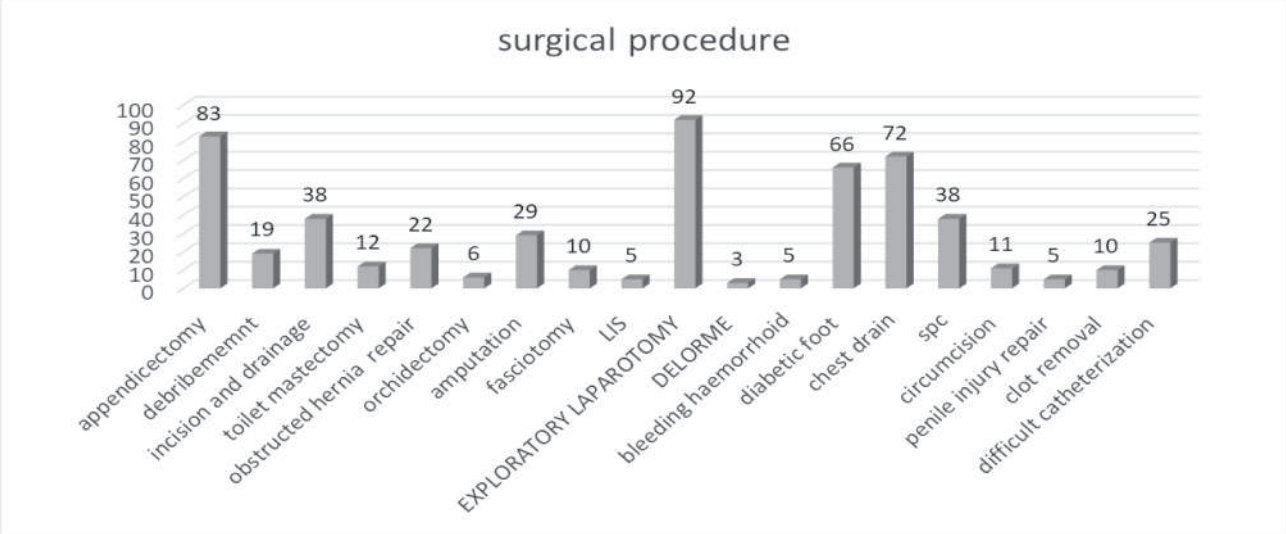

Figure 2: Distribution of various types of emergency surgeries.

(29 cases), and repair of obstructed hernias (22 cases).

Less commonly performed procedures included debridement (19 cases), toilet mastectomy (12 cases), orchidectomy (6 cases), amputation (6 cases), penile injury repair (5 cases), clot removal (10 cases), and circumcision (11 cases). Rare procedures included lateral internal sphincterotomy (LIS) (5 cases) and Delorme's procedure (3 cases) for rectal prolapse. This distribution reflects the diverse surgical workload managed in the emergency setting, with abdominal, soft tissue, and urological conditions comprising the majority of interventions (Figure 2).

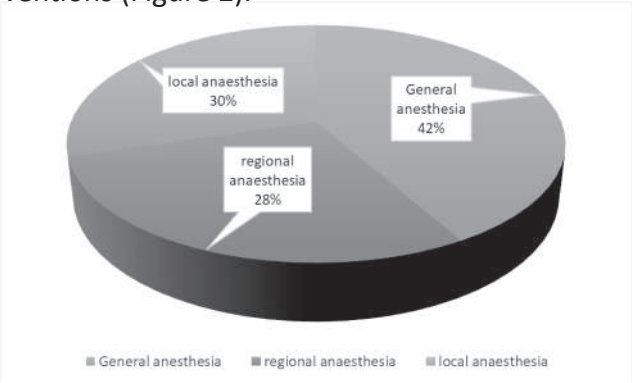

Figure 3: Distribution of patients undergone emergency surgeries according to type of anaesthesia.

General anesthesia was the most commonly used technique, administered in 42% of emergency surgical procedures. Regional anesthesia was used in 28% of cases, while local anesthesia accounted for 30% of procedures. This distribution reflects the varied nature and complexity of surgical emergencies managed during the study period (Figure 3).

In this study, postoperative complications showed considerable variation in distribution. Surgical site infection (SSI) was the most prevalent complication, occurring in 40 patients (33.9%), highlighting infection as the major source of morbidity. Wound dehiscence was the second most common, affecting 16 patients (13.6%). Intra-abdominal abscess and septicaemia were each observed in 14 patients (11.9%), indicating significant postoperative infectious risks. Anastomotic leak occurred in 10 patients (8.5%), while stoma-related complications were reported in 8 patients (6.8%). Paralytic ileus affected 7 patients (5.9%), whereas incisional hernia and faecal fistula were less common, occurring in 4 (3.4%) and 3 (2.5%) patients respectively. Pneumonia was the least frequent complication, identified in only 2 patients (1.7%). Overall, infective complications—including SSI, septicaemia,

intra-abdominal abscess, and pneumonia—constituted the majority of postoperative morbidity, underscoring the need for rigorous perioperative infection prevention and vigilant postoperative monitoring.(Figure 4)

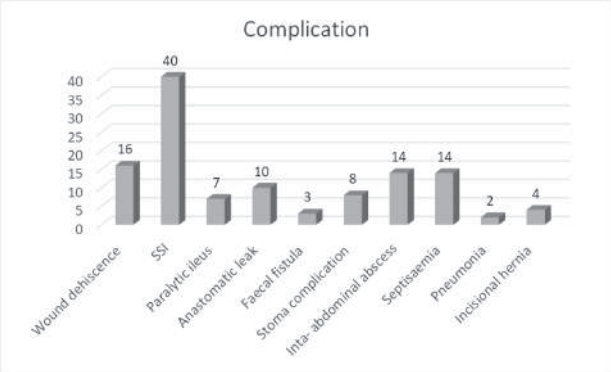

Figure 4: Distribution of patient according to post-operative complication.

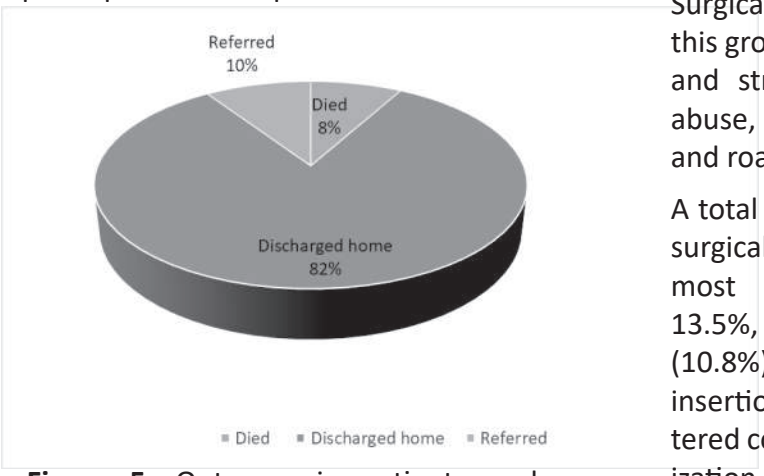

Figure 5: Outcome in patients undergone emergency surgery.

The pie chart illustrates the outcome distribution of the study population. The majority of patients, comprising 82%, were successfully discharged home, indicating favorable postoperative recovery in most cases. A smaller proportion, 10%, required referral to higher centers for further management, reflecting the presence of conditions or complications that necessitated advanced care. The mortality rate was 8%, representing the group of patients who unfortunately succumbed to their illness or postoperative complications. Overall, the findings demonstrate that while most patients achieved satisfactory outcomes, a notable minority required escalated care or experienced adverse outcomes, underscoring the importance of early recognition and effective management of high-risk cases (Figure 5).

Discussion

In our study surgical emergencies were found to be more common in male when compared to females. Male to female ratio was 1.35:1. Present study confirms with Onyemaechi et al. [12] with male female ratio of 1.65:1 with male female ratio of 2:1. The minimum age of the patients was 13 years and the maximum age was 90 years, with most common age group between 41-60 years followed by 21-40 years. Surgical emergencies are common in people of this group because of their activities and stress and strains of life are prone for analgesic abuse, alcohol abuse and acid peptic disease and road traffic accidents.

A total of 613 patients presented with various surgical emergencies. Appendicitis was the most common diagnosis, accounting for 13.5%, followed by diabetic foot infections (10.8%), and procedures requiring chest drain insertion (11.7%). Other frequently encountered conditions included suprapubic catheterization issues (6.2%), burn injuries (5.9%), hollow viscus perforation (5.7%), and intestinal obstruction (5.2%). Abscesses (4.1%), difficult catheterization (4.1%), peripheral vascular disease (4.7%), obstructed hernias (3.6%), and head injuries (3.6%) also contributed notably to the workload. Less common presentations were Fournier's gangrene (3.1%), blunt abdominal trauma (3.1%), non-viable testis (1.0%), compartment syndrome (1.6%), and bleeding hemorrhoids (0.8%). Rare diagnoses included rectal prolapse, perineal abscess, psoas abscess, and ruptured ectopic pregnancy. This distribution highlights the broad spectrum of surgical emergencies managed in our

hospital. Present study confirms with Onyemaechi et al. [12] with most common emergency surgery performed was exploratory laparotomy (56%) and with most common emergency surgery performed was appendectomy (16.5%) followed by exploratory laparotomy. Our study also confirms with Anjali verma et al 20168 and Ibrahim et al 20159 with most common emergency surgery performed in both of studies were exploratory laparotomy followed by appendectomy.

Limitations of the study

The obstetric and gynaecological, paediatric, orthopaedic, neurosurgical emergencies were excluded from this study.

Conclusion

Majority of surgical admissions in our center were emergency admissions with a predominance of trauma-related surgical emergencies. Road traffic injuries contributed significantly to the total volume of surgical emergencies seen in our hospital. Provision of improved neurosurgical services and intensive care facilities will improve the outcome of trauma-related surgical emergencies in our environment. Early detection of cancers and improved oncology services may reduce the mortality arising from non-trauma surgical emergencies. The results of our study may be helpful in the planning and provision of better emergency surgical services to improve outcomes.

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Conflict of interest: None.

References

1. Mai-Phan TA, Patel B, Walsh M, Abraham AT, Kocher HM. Emergency room surgical workload in an inner-city UK teaching hospital. World J Emerg Surg. 2008;3:19.

2. Ahmed A. Trends in emergency surgical admissions in a tertiary health centre in Nigeria. West Afr J Med. 2009;28(2):106-9.

3. Capewell S. The continuing rise in emergency admissions. BMJ. 1996;312(7037):991-2.

4. Adesunkanmi AR, Agbakwuru EA. Changing pattern of acute intestinal obstruction in a tropical African population. East Afr Med J. 1996;73(11):727-31.

5. Afsana K. The tremendous cost of seeking hospital obstetric care in Bangladesh. Reprod Health Matters. 2004;12(24):171-80.

6. Mofikoya BO, Enweluzo GO, Tijani KH, Ogunleye EO, Kanu OO. Emergency surgical services in a sub-Saharan African country: Can we meet the needs? Eur J Sci Res. 2010;43:265-71.

7. Ahmed M, Ali Shah M, Luby S, Drago-Johnson P, Wali S. Survey of surgical emergencies in a rural population in the northern areas of Pakistan. Trop Med Int Health. 1999;4(12):846-51.

8. Verma A, Verma S, Garg P, Godara R, Karwasra RK, Verma N. Surgical emergencies in a tertiary care hospital: A brief overview. Int J Contemp Med Res. 2016;3(3):648-51.

9. Solagberu BA, Duze AT, Kuranga SA, Adekanye AO, Ofoegbu CK, Odelowo EO. Surgical emergencies in a Nigerian university hospital. Niger Postgrad Med J. 2003;10(3):140-3.

10. Ibrahim NA, Oludara MA, Mustafa I, et al. Non-trauma surgical emergencies in adults: Spectrum, challenges and outcome of care. Ann Med Surg. 2015;4:325-30.

11. Kakkar M, Priya S, Bamba C, Jain S. Audit of emergency surgical cases in a tertiary care hospital in urban India. Int J Contemp Med Res. 2020;7(8):H1-H6.

12. Onyemaechi NO, Urube SU, Ekenze SO. Pattern of surgical emergencies in a Nigerian tertiary hospital. Afr Health Sci. 2019;19(1):1768-77.

Original Article

Challenges of Surgical Treatment of Thoracolumbar Burst Fracture in a District-Level Hospital: Experience from Satkhira

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Abstract

Background: Thoracolumbar burst fractures are a common cause of spinal instability and neurological deficits. Management in district-level hospitals presents unique challenges due to limited resources, delayed presentation, and constrained operative facilities. Understanding outcomes and predictors of poor recovery is essential for improving patient care in such settings. Aim of the study: To evaluate the clinical, radiological, and functional outcomes of thoracolumbar burst fractures treated surgically in a district-level hospital in Satkhira, and to identify factors associated with poor postoperative outcomes. **Methods:** A retrospective observational study was conducted on 163 patients with thoracolumbar burst fractures managed surgically between January 2020 and January 2025 at Satkhira District Hospital. Demographic, clinical, radiological, and operative data were collected. Neurological status was assessed using the ASIA grading system, and functional outcomes were evaluated with the Oswestry Disability Index (ODI). Radiological outcomes included kyphosis correction and fusion status. Univariate and multivariable logistic regression analyses were performed to identify predictors of poor postoperative outcomes. **Result:** The mean age was 32.4 ± 11.6 years, with a male predominance (61.96%). Falls from height (57.67%) and road traffic accidents (34.36%) were the most common mechanisms. Combined/posterior fixation with decompression was performed in 147 patients (90.18%), and posterior-only fixation in 16 patients (9.82%), with a median of 4 instrumented levels (range 3–6). Mean operative time was 138 ± 34 minutes, and mean blood loss was 410 ± 160 mL. Neurological improvement of ≥1 ASIA grade was observed in 150 patients (92.02%), and mean ODI at final follow-up was 18.4 ± 7.9. Immediate postoperative kyphosis improved from 21.6 ± 6.9° to 7.2 ± 3.1°, with a mean loss of correction of 1.9 ± 1.3° at final follow-up. Fusion was achieved in 149 patients (91.41%), and the overall complication rate was 15.34%. Multivariable analysis identified age >60 years, delayed surgery >72 hours, ASIA grade A–B at presentation, and canal compromise >50% as independent predictors of poor outcomes ($p < 0.05$). **Conclusion:** Surgical management of thoracolumbar burst fractures in a district-level hospital can achieve favorable neurological and functional outcomes. However, advanced age, delayed intervention, severe initial neurological deficits, and extensive canal compromise are significant predictors of poor recovery. Early surgical intervention and careful patient selection are crucial to optimize outcomes in resource-limited settings.

Keywords: Thoracolumbar burst fracture, Spinal surgery, District hospital, Neurological outcome, Kyphosis correction, Predictors of poor outcome

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Introduction

A thoracolumbar burst fracture is an axial-load-induced injury of the thoracolumbar junction characterized by vertebral body comminution and potential retropulsion of bone fragments into the spinal canal [1]. Globally, thoracolumbar fractures account for approximately 6.9% of all blunt-trauma spinal injuries, with an estimated annual incidence of about 30 cases per 100,000 population [1,2]. In Bangladesh, thoracolumbar burst fractures represent an estimated 20–35% prevalence among hospitalized spinal fracture cases [3,4]. Thoracolumbar burst fractures typically result from high-energy axial compression forces that disrupt both the anterior and middle spinal columns, often with bone retropulsion into the spinal canal; they commonly occur at the transition zone between the more rigid thoracic and mobile lumbar spine, making this region biomechanically vulnerable to trauma. Burst fractures are frequently caused by motor vehicle collisions and falls from height, which are major sources of traumatic spinal injuries globally, and factors such as laminar fractures further increase the risk of neurological compromise after these injuries [5]. The consequences of burst fractures are profound: patients often endure severe back pain, spinal instability, and potential neurological deficits, significantly affecting mobility and quality of life. Up to 30% of thoracolumbar fracture cases may involve neurological injury, leading to long-term functional limitations, chronic pain, and difficulty returning to work and daily activities, compounding the socioeconomic burden for individuals and families [6] The clinical decision between surgical and non-surgical management remains contentious, especially for neurologically intact patients. An international study found that while surgical and conservative treatments led to similar disability outcomes at one-year, surgical patients tended to achieve minimal disability earlier, suggesting potential benefit in recovery trajectory [7]. Surgically, decompression and stabilization techniques - including posterior pedicle screw fixation - aim to restore alignment, maintain mechanical stability, and prevent secondary deformity, which can facilitate early mobilization and potentially reduce long-term disability [8]. Moreover, posterior approaches may offer advantages such as reduced operative time and blood loss compared with anterior approaches, while still achieving satisfactory correction and stability [2]. However, disadvantages and challenges of surgical treatment are equally significant: evidence shows that surgery is often associated with higher rates of early complications and increased initial healthcare costs, and there is limited high-certainty evidence that it produces superior long-term functional outcomes over conservative care in neurologically intact patients [9]. Additionally, surgery requires infrastructure and specialist expertise not always available in resource-limited district hospitals, further complicating decision-making. Long-term economic analyses suggest that surgical management can become more cost-effective from a societal perspective due to earlier return to productivity, yet this must be balanced against operative risks, patient health status, and resource constraints [10]. The study aimed to share practical experiences and highlight the major challenges encountered during the surgical management of thoracolumbar burst fractures in a district-level hospital setting.

Methodology

This was a retrospective observational study conducted at Satkhira District Hospital, Bangladesh, analyzing patients who underwent surgical management for thoracolumbar burst fractures between January 2020 and January 2025. The study was approved by the institutional ethics committee, and the requirement for informed consent was waived due to the retrospective nature of the study. A total of

163 patients met the inclusion criteria and were analyzed.

Inclusion and Exclusion Criteria:

All consecutive patients aged ≥18 years with radiologically confirmed thoracolumbar burst fractures (T10–L4) who underwent surgical fixation during the study period were included. Patients with pathological fractures, polytrauma with life-threatening injuries, previous spinal surgery, or incomplete medical records were excluded.

Surgical Technique

All surgeries were performed by the same team of spine surgeons using a posterior approach. Instrumentation was performed using pedicle screw fixation spanning 3–6 levels based on fracture pattern and stability. Decompression was performed as indicated by neurological deficit or radiological evidence of canal compromise. Patients requiring combined posterior-anterior stabilization were operated via staged procedures, though the majority underwent posterior-only fixation.

Data Collection

Data were extracted from hospital medical records, operative notes, and radiological reports. Variables collected included demographic characteristics (age, gender), mechanism of injury, fracture level, preoperative neurological status using the American Spinal Injury Association (ASIA) impairment scale, radiological parameters (kyphotic angle, canal compromise, load-sharing score, posterior ligament complex injury), surgical details (timing, approach, levels instrumented, decompression, operative time, estimated blood loss), and postoperative outcomes (neurological recovery, functional status, complications, radiological outcomes).

Postoperative Care and Follow-up

Postoperatively, patients received standardized pain management, early mobilization with appropriate spinal support, and physiotherapy. Neurological status was assessed at discharge and during follow-up visits at 1, 3, 6, and 12 months using the ASIA scale. Functional outcomes were evaluated using the Oswestry Disability Index (ODI), ambulation status, and return to independent daily activities. Radiological assessment included measurement of kyphotic angle and evaluation of fusion status on follow-up imaging.

Outcome Measures

The primary outcome was neurological recovery, defined as an improvement of at least one ASIA grade. Secondary outcomes included functional recovery (ODI scores and ambulatory status), radiological outcomes (kyphosis correction and fusion rate), and postoperative complications. Predictors of poor outcome were analyzed using univariate and multivariable logistic regression.

Statistical Analysis

Data were analyzed using statistical software, SPSS version 26. Continuous variables were expressed as mean ± standard deviation (SD) or median with interquartile range (IQR), as appropriate. Categorical variables were summarized as frequencies and percentages. Associations between potential predictors and poor outcome were assessed using univariate and multivariable logistic regression. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported, and a p-value <0.05 was considered statistically significant.

Result

The mean age was 32.4±11.6 years, with most patients aged 21–40 years (52.76%), followed by those ≤20 years (23.31%) (Table 1). Males constituted 61.96% of the study. Falls from height were the most common mechanism of injury (57.67%), followed by road traffic accidents (34.36%). The most frequently involved fracture level was L1 (43.56%), followed by

T10–T12 (31.90%) and L2–L4 (24.54%). Table 2 shows that most patients had moderate to severe deficits (ASIA B 32%, C 44%), while postoperatively, the majority improved to Grade D or E, with 42% achieving full recovery (Grade E) and only 2% remaining unchanged (Grade A). The canal compromise of 30–50% was most frequent (42.33%); <30% and >50% were each seen in 28.83% (Table 3). The mean kyphotic angle was 21.6 ± 6.9°, with load-sharing score ≥ 7 in 36.20% and posterior ligament complex injury in 26.99%. Table 4 shows that early surgery (≤72 hours) was performed in 66.26%, combined/posterior with decompression in 90.18%, with a median of 4 levels (range 3–6); a mean operative time of 138±34 minutes and blood loss of 410±160 mL. At final follow-up, 69.33% of patients improved by at least two ASIA grades and 28.83% by at least one grade, with minimal neurological non-recovery (1.84%) (Table 5). Most patients were ambulatory (80.98%) and had low residual disability (mean ODI 18.4 ± 7.9), while 78.53% regained independent daily functioning. Median follow-up was 9 months (IQR, 6–18). Table 6 indicates that the mean kyphotic angle improved from 21.6±6.9° preoperatively to 7.2±3.1° postoperatively, slightly increasing to 9.1±3.8° at final follow-up; mean correction was 12.5±5.4° with 1.9±1.3° loss, and fusion was achieved in 91.41%. Postoperative complications occurred in 3.07% of patients, with superficial surgical site infection being the most common (1.84%) and no cases of deep infection, implant failure, or neurological deterioration were observed (Table 7). Table 8 shows that the older age (>60 years), delayed surgery (>72 hours), severe initial neurological deficit (ASIA A–B), and canal compromise >50% were independent predictors of poor outcome, whereas load-sharing score ≥7 and posterior ligament complex injury were not significant after adjustment.

Table I: Baseline Demographic and Injury Characteristics (N = 163)

Variable	Frequency (n)	Percentage (%)
Age (years)		
≤20	38	23.31
21–40	86	52.76
41–60	28	17.18
>60	11	6.75
Mean ± SD	32.4 ± 11.6	
Gender		
Male	101	61.96
Female	62	38.04
Mechanism of injury		
Fall from height	94	57.67
Road traffic accident	56	34.36
Other	13	7.98
Fracture level		
T10–T12	52	31.90
L1	71	43.56
L2–L4	40	24.54

Table II: Preoperative Neurological Status (ASIA Grade).

Before Operation		After Operation	
Grade	**Frequency** n (%)	**Grade**	**Frequency** n (%)
A	3 (2)	A	3 (2)
B	52 (32)	D	16 (10)
		E	35 (22)
C	71 (44)	D	3 (2)
		E	68 (42)
D	35 (22)	E	35 (22)

Table III: Radiological Characteristics at Presentation.

Parameter	Frequency (n)	Percentage (%)
Canal compromise		
<30%	47	28.83
30–50%	69	42.33
>50%	47	28.83
Mean kyphotic angle (°)		
Mean ± SD	21.6 ± 6.9	
Load-sharing score ≥7	59	36.20
Posterior ligament complex injury	44	26.99

Table IV: Operative Details and Timing of Surgery.

Variable	Frequency (n)	Percentage (%)
Time to surgery		
≤72 hours	108	66.26
>72 hours	55	33.74
Surgical approach		
Combined/posterior with decompression	147	90.18
Posterior-only fixation	16	9.82
Levels instrumented, median (range)	4 (3–6)	
Mean operative time (minutes)	138 ± 34	
Estimated blood loss (mL), mean ± SD	410 ± 160	

Table V: Neurological and Functional Outcomes.

Outcome	Frequency (n)	Percentage (%)
Improvement ≥2 ASIA grades	113	69.33
Improvement ≥1 ASIA grade	47	28.83
No change	3	1.84
Ambulatory at final follow-up, n (%)	132	80.98
ODI score at final follow-up, mean ± SD	18.4 ± 7.9	
Return to independent daily activity, n (%)	128	78.53
Median follow-up duration (months), IQR	9 (6–18)	

Table VI: Radiological Outcomes.

Parameter	Value
Immediate postoperative kyphosis (°) (mean ± SD)	7.2 ± 3.1
Kyphosis at final follow-up (°) (mean ± SD)	9.1 ± 3.8
Mean kyphosis correction (°) (mean ± SD)	12.5 ± 5.4
Loss of correction (°) (mean ± SD)	1.9 ± 1.3
Fusion achieved at final follow-up n	149 (91.41)

Table VII: Postoperative Complications.

Complication	Frequency (n)	Percentage (%)
Superficial surgical site infection	3	1.84
Deep infection	0	0.00
Implant failure	0	0.00
Neurological deterioration	0	0.00
Pressure sore	2	1.23
Overall complication rate	5	3.07

Discussion

Thoracolumbar burst fractures represent a complex spectrum of spinal injuries that pose significant diagnostic, surgical, and resource-related challenges, particularly when managed in district-level hospitals with limited infrastructure and specialized support [11]. The mean age was 32.4 ± 11.6 years, with most patients aged 21–40 years (52.8%). Males comprised 62% of cases. Falls from height were the leading mechanism (57.7%), followed by road traffic accidents (34.4%). Fractures most commonly involved L1 (43.6%), T10–T12 (31.9%), and L2–L4 (24.5%). Similarly, Elkahla et al. reported 70.19% males and 29.81% females, with a mean age of 40.94 years (range 15–75). The 20–40-year age group accounted for 46% of cases. Falls from height were the leading mechanism of injury (67%), followed by road traffic accidents (22%). Most fractures (53%) involved the thoracolumbar junction

Table VIII: Predictors of Poor Outcome After Thoracolumbar Burst Fracture Surgery.

Variable	Univariate OR (95% CI)	p-value	Multivariable Adjusted OR (95% CI)	p-value
Age >60 years	2.89 (1.35–6.18)	0.006	2.41 (1.09–5.33)	0.031
Delayed surgery >72 hours	3.45 (1.87–6.37)	<0.001	3.12 (1.61–6.04)	0.001
ASIA A–B at presentation	5.12 (2.58–10.17)	<0.001	4.78 (2.21–10.32)	<0.001
Canal compromise >50%	3.02 (1.55–5.87)	0.001	2.69 (1.37–5.27)	0.004
Load-sharing score ≥7	1.71 (0.92–3.18)	0.089	1.42 (0.73–2.77)	0.302
Posterior ligament complex injury	1.49 (0.77–2.86)	0.228	1.32 (0.66–2.63)	0.431

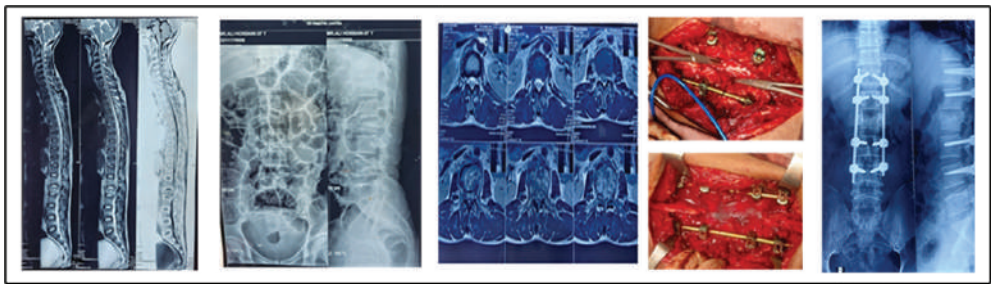

Figure 1: Surgical treatment of thoracolumbar burst fracture.

(T12–L1) [12]. Khurjekar et al. reported 89.13% males and 10.87% females. The mean age was 32 years (range 18–59), with males averaging 33 years and females 31.5 years. Falls from height were the most common mechanism (50%), followed by road traffic accidents (46.7%) [13]. Postoperative improvements were notable, with most patients progressing from ASIA B–C to D–E, highlighting the efficacy of timely intervention, though recovery remained limited in those with preoperative Grade A deficits in this study. Reinhold et al. reported 57.8% type A (compression), 24.3% type B (distraction), and 17.9% type C (rotation) injuries. Complete neurological deficits (Frankel/ASIA A) occurred in 9% of patients, incomplete deficits (Frankel/ASIA B–D) in 74%, and no deficits (Frankel/ASIA E) in 74% [14]. Khan et al. reported ASIA B in 18 patients (25%), ASIA C in 29 (40.3%), and ASIA D in 25 (34.7%) [15]. Canal compromise of 30–50% was most common (42.33%), with <30% and >50% each in 28.83%. Mean kyphosis was 21.6 ± 6.9°; load-sharing score ≥7 in 36.2% and posterior ligament complex injury in 27%. Lee et al. assessed significant differences in radiological parameters between success and failure groups. SCC (27.9 ± 7.6% vs. 35.7 ± 13.3%, p = 0.03) and LOVBH (28.6 ± 7.8% vs. 34.1 ± 6.0%, p = 0.01) were lower in the success group, while KA was 10.1 ± 6.2° versus 13.9 ± 5.0° in failures

(p = 0.04) [16]. Early surgery (≤72 h) was performed in 66.3%; combined/posterior with decompression in 90.2% over a median of 4 levels (range 3–6); mean operative time 138 ± 34 min and blood loss 410 ± 160 mL. Medrano et al. found that the posterior approach had shorter operative time (87.97 min; 53.91–122.03; p < 0.0001) and lower blood loss (497.04 mL; 281.8–712.28; p < 0.0001), while hospital stay, complications, reintervention rate, neurological outcomes, postoperative kyphosis, and costs were comparable between approaches [17]. At follow-up, most patients showed marked neurological recovery with high ambulatory rates and low residual disability, alongside substantial return to independent daily functioning over a median follow-up of 9 months. Mittal et al. reported neurological improvement in 80.5% of patients postoperatively, positively correlating with percentage change in canal encroachment (r = 0.64, P = 0.018). Mean kyphosis improved from 29.1° ± 11.9° preoperatively to 9.4° ± 3.8° immediately postoperatively and 15.7° ± 11.8° at final follow-up (P < 0.001) [18]. Mean kyphosis improved from 21.6 ± 6.9° preoperatively to 7.2 ± 3.1° postoperatively, slightly increasing to 9.1 ± 3.8° at final follow-up; mean correction 12.5 ± 5.4° with 1.9 ± 1.3° loss; fusion achieved in 91.4%. Though Sinha et al. reported no significant differences among groups in kyphosis correction, canal clearance, or fusion status [19]. Postoperative complications occurred in 3.07%, superficial surgical site infections occurred in 1.84% of patients, and pressure sores were noted in 1.23%. Elkahla et al. reported a mean postoperative hospital stay of 5.4 days, with a 2.9% complication rate. At final follow-up, 80% of patients with incomplete neurological deficits showed improvement [12]. Older age (>60 y), delayed surgery (>72 h), severe initial neurological deficit (ASIA A–B), and canal compromise >50% independently predicted poor outcomes, while load-sharing score ≥7 and posterior ligament complex injury were not significant after adjustment. Landi et al. found that early surgery, irrespective of fracture location or type, reduced median hospital and ICU stay and nosocomial complications. Thoracic fractures were associated with the poorest outcomes, and early intervention improved results depending on the preoperative ASIA score [20].

Limitations of the study: The limitations are:

- Inability to directly compare surgical outcomes with conservative management or alternative fixation strategies.
- Short-term follow-up, restricting evaluation of long-term outcomes such as late deformity or implant failure

Conclusion

Surgical management of thoracolumbar burst fractures at a district-level hospital in Satkhira demonstrated favorable neurological, functional, and radiological outcomes, with the majority of patients achieving significant improvement in ASIA grade, ambulatory status, and ODI scores. Posterior-only fixation with timely decompression effectively restored spinal alignment and achieved high fusion rates, while postoperative complications remained relatively low. Early intervention, younger age, less severe initial neurological deficit, and limited canal compromise were associated with better outcomes, highlighting the importance of prompt and appropriate surgical care. Despite resource constraints, district hospitals can safely perform these procedures with careful patient selection, standardized protocols, and dedicated surgical expertise.

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Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

References

1. Katsuura Y, Osborn JM, Cason GW. The epidemiology of thoracolumbar trauma: a meta-analysis. Journal of orthopaedics. 2016 Dec 1;13(4):383-8.
2. Zileli M, Sharif S, Fornari M. Incidence and epidemiology of thoracolumbar spine fractures: WFNS spine committee recommendations. Neurospine. 2021 Dec 31;18(4):704.
3. Choudhury AA, Alam MS, Azad AK, Akhter K. Outcome of unstable thoracolumbar fracture following long segment posterior fixation. Journal of Bangladesh College of Physicians and Surgeons. 2021 Mar 11;39(2):114-22.
4. Ghandour M, Mert Ü, Pishnamaz M, Hildebrand F, Sobottke R, Kabir K, Mahmoud MA. Refracture and Mortality Following Surgical Management of Osteoporotic Vertebral Fractures: A Systematic Review and Meta-Analysis with Patient-Level Survival Modeling. Journal of clinical medicine. 2025 Nov 20;14(22):8230.
5. Abudou M, Chen X, Kong X, Wu T. Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit. Cochrane Database of Systematic Reviews. 2013(6).
6. Chou TY, Tsuang FY, Hsu YL, Chai CL. Surgical versus non-surgical treatment for thoracolumbar burst fractures without neurological deficit: a systematic review and meta-analysis. Global Spine Journal. 2024 Mar;14(2):740-9.
7. Dvorak MF, Öner CF, Dandurand C, Schnake KJ, Bransford RJ, Popescu EC, El-Sharkawi M, Rajasekaran S, Benneker LM, Schroeder GD, Tee JW. Surgical versus Non-Surgical Treatment of Thoracolumbar Burst Fractures in Neurologically Intact Patients: A Prospective International Multicentre Cohort Study. Global Spine Journal. 2025 Jul 3:21925682251356910.
8. De Robertis M, Anselmi L, Baram A, Tropeano MP, Morenghi E, Ajello D, Cracchiolo G, Capo G, Tomei M, Ortolina A, Fornari M. Percutaneous Treatment of Traumatic A3 Burst Fractures of the Thoracolumbar Junction Without Neurological Impairment: The Role of Timing and Characteristics of Fragment Blocks on Ligamentotaxis Efficiency. Journal of Clinical Medicine. 2025 Apr 17;14(8):2772.
9. Morrissey PB, Shafi KA, Wagner SC, Butler JS, Kaye ID, Sebastian AS, Schroeder GD, Kepler CK, Aarabi B, Oner FC, Vaccaro AR. Surgical management of thoracolumbar burst fractures: surgical decision-making using the AOSpine thoracolumbar injury classification score and thoracolumbar injury classification and severity score. Clinical spine surgery. 2021 Feb 1;34(1):4-13.
10. Feng D, Duan Y, Chen J, Wu Y, Li T, Wang Y, Jiang L, Huang Y. Posterior Pedicle Screw Fixation with Indirect Decompression Versus Direct Decompression in Treating Thoracolumbar Burst Fracture: A Systematic Review and Meta-Analysis. World Neurosurgery. 2024 Jun 1; 186:27-34.
11. Cahueque M, Cobar A, Zuniga C, Caldera G. Management of burst fractures in the thoracolumbar spine. Journal of orthopaedics. 2016 Dec 1;13(4):278-81.
12. Elkahla G, Trifa A, Darmoul M. The validity of posterior approach in thoracolumbar spine fracture surgery: A study of 104 cases with literature review. Journal of Craniovertebral Junction and Spine. 2025 Apr 1;16(2):212-7.
13. Khurjekar K, Hadgaonkar S, Kothari A, Raut R, Krishnan V, Shyam A, Sancheti P. Demographics of thoracolumbar fracture in Indian population presenting to a tertiary level trauma centre. Asian Spine Journal. 2015 Jun 8;9(3):344.
14. Reinhold M, Knop C, Beisse R, Audigé L, Kandziora F, Pizanis A, Pranzl R, Gercek E, Schultheiss M, Weckbach A, Bühren V. Operative treatment of 733 patients with acute thoracolumbar spinal injuries: comprehensive results from the second, prospective, Internet-based multicenter study of the Spine Study Group of the German Association of Trauma Surgery. European Spine Journal. 2010 Oct;19(10):1657-76.
15. Khan MZ, Khaliq F, Mehmood S, Khan MA, Awan MMY, Ghani MA. Neurological outcomes in patients with thoracolumbar vertebral fractures and motor deficits undergoing early surgical stabilization. J Popul Ther Clin Pharmacol. 2025;32(4):974–80.
16. Lee NH, Kim SK, Seo HY, Park ET, Jang WY. How should patients with a Thoracolumbar Injury classification and severity score of 4 be treated? Journal of clinical medicine. 2021 Oct 26;10(21):4944.
17. Roblesgil-Medrano A, Tellez-Garcia E, Bueno-Gutierrez LC, Villarreal-Espinosa JB, Galindo-Garza CA, Rodriguez-Barreda JR, Flores-Villalba E, Hinojosa-Gonzalez DE, Figueroa-Sanchez JA. Thoracolumbar burst fractures: a systematic review and meta-analysis on the anterior and posterior approaches. Spine Surgery and Related Research. 2022 Mar 27;6(2):99-108.
18. Mittal S, Rana A, Ahuja K, Ifthekar S, Yadav G, Sudhakar PV, Sinha SK, Kar S, Sarkar B, Kandwal P, Farooque K. Outcomes of Anterior Decompression and Anterior Instrumentation in Thoracolumbar Burst Fractures—A Prospective Observational Study with Mid-Term Follow-up. Journal of Orthopaedic Trauma. 2022 Apr 1;36(4):136-41.
19. Sinha SK, Verma V, Regmi A, Sudhakar PV, Goyal N, Sethy SS, Jain A, Verma A, Kandwal P, Sarkar B. Surgical management of thoracolumbar burst fractures by three different posterior techniques: A prospective comparative study. Journal of Clinical Orthopaedics and Trauma. 2024 Nov 1; 58:102564.
20. Landi A, Marotta N, Ambrosone A, Prizio E, Mancarella C, Gregori F, La Torre G, Santoro A, Delfini R. Correlation between timing of surgery and outcome in thoracolumbar fractures: does early surgery influence neurological recovery and functional restoration? A multivariate analysis of results in our experience. Trends in Reconstructive Neurosurgery: Neurorehabilitation, Restoration and Reconstruction. 2017 Jan 1:231-8.

Original Article

Outcomes of Hypoxic Ischemic Encephalopathy in Term Neonates: Experience from a Tertiary Care Hospital

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Abstract

Background: Hypoxic ischemic encephalopathy (HIE) is a significant cause of neonatal morbidity and mortality, particularly in term neonates, with outcomes closely linked to the severity of initial brain injury. Limited data exist in Bangladesh regarding early neurodevelopmental outcomes in affected neonates. **Aim of the study:** To assess the short-term neurodevelopmental outcomes of term neonates with HIE and examine their association with disease severity in a tertiary care hospital setting. **Methods:** A prospective longitudinal study was conducted at Bangladesh Shishu Hospital & Institute from January to December 2020. Term neonates with perinatal asphyxia and clinical features of HIE were enrolled. Severity was classified using Sarnat staging. Neurodevelopmental outcomes were assessed at discharge, 3 months, and 6 months using the Rapid Neurodevelopmental Assessment (RNDA) tool. Statistical analysis was performed using SPSS 23, with significance set at $p < 0.05$. **Results:** Among 127 neonates, 65.40% were male. Moderate HIE was most common (59.80%), followed by mild (37.00%) and severe (3.10%). At discharge, 49.60% had normal development, 12.60% had mild to moderate deficits, and 37.80% had severe impairment or death. At 3 months, normal outcomes slightly increased to 50.40%, and by 6 months, 51.20% demonstrated normal development. Mild HIE was associated with better outcomes, while severe HIE showed the poorest prognosis. Associations between HIE severity and outcomes were statistically significant at discharge ($p = 0.023$) and at 3 months ($p = 0.018$), with borderline significance at 6 months ($p = 0.052$). **Conclusion:** Neurodevelopmental outcomes in term neonates with hypoxic–ischemic encephalopathy are closely related to the severity of the initial insult.

Keywords: Hypoxic Ischemic Encephalopathy (HIE), Term Neonates, Neurodevelopmental Outcomes, Perinatal Asphyxia, Severity of HIE.

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Introduction

Hypoxic-ischemic encephalopathy (HIE) is a serious form of neonatal brain injury resulting from impaired cerebral blood flow and oxygenation during the prenatal, intrapartum, or postnatal period [1]. It remains the most common cause of encephalopathy among full-term neonates, with a global incidence of approximately 2 per 1000 live births [2]. In Bangladesh, the burden is comparatively higher, largely due to the high proportion of home deliveries and delays in seeking intrapartum care, which increase the likelihood of prolonged and obstructed labor—major

contributors to hypoxic-ischemic brain injury [3]. HIE is associated with significant mortality and long-term neurodevelopmental disabilities, including cerebral palsy, hearing impairment, visual deficits, intellectual disability, and epilepsy [4]. The neurodevelopmental outcome is closely linked to the severity of the initial insult, adverse outcomes are uncommon in mild HIE, increasingly frequent in moderate HIE, and almost inevitable in severe cases [5-7]. Early identification and stratification of HIE severity are therefore essential for optimizing management, prognostication, and timely initiation of developmental interventions.

Understanding short-term outcomes during the neonatal period provides valuable insight into early morbidity patterns and helps guide follow-up planning. Despite the high burden of perinatal asphyxia in low-resource settings, data on the short-term clinical outcomes of HIE remain limited.

Against this background, the present study aims to determine the incidence, severity distribution, and short-term outcomes of HIE among full-term neonates admitted to a tertiary care hospital. This institutional experience is expected to contribute to improving early recognition, management strategies, and follow-up for affected neonates.

Methodology & Materials

This prospective longitudinal study was conducted among term neonates with perinatal asphyxia admitted to the neonatal ward at Bangladesh Shishu Hospital & Institute from January 2020 to December 2020.

Inclusion Criteria:

- Term neonates (gestational age > 37 weeks) with perinatal asphyxia requiring resuscitation and/or with a documented Apgar score <7 at 10 minutes.
- Neonates with clinical features of HIE.

Exclusion Criteria:

- Major congenital anomalies
- Requirement of ventilator or inotropic support
- Congenital heart disease
- Suspected neurometabolic disorders
- Early-onset jaundice (within the first day of life)
- Hemolytic jaundice due to Rh or ABO incompatibility
- Intracranial infections.

Data Collection

Data were collected after obtaining written informed consent from the parents. At admission, all the neonates were managed according to the hospital's standardized protocol. The severity of HIE was classified into mild (HIE stage I), moderate (HIE stage II), and severe HIE (HIE stage III) based on Sarnat and Sarnat's classification system for HIE [8]. Neurodevelopmental assessment of all neonates were performed using Rapid Neurodevelopmental Assessment (RNDA) tools during discharge, as well as at 3 and 6 months [9].

Neurodevelopmental assessment for eight domains (gross motor, fine motor, vision, hearing, speech, cognition, behavior, seizure) was coded as

Score 0: Normal (If there were none or 1 or 2 domain impairments).

Score 1: mild-to-moderate deficits (If there was 3 domain impairment).

Score 2: severe deficits or death (If there was >3 domain impairment).

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee. Written informed consent was obtained from the parents before participation. Confidentiality and autonomy of all participants were strictly maintained.

Statistical Analysis

Data were processed and analyzed using IBM

SPSS version 23. Categorical variables were reported as frequencies and percentages. The Pearson Chi-Square test (for 2x2 comparisons) and Fisher's exact test were used to assess associations between HIE severity and neurodevelopmental outcomes. A p-value <0.05 was considered statistically significant.

Result

Among 127 neonates the majority were male (65.4%). (Fig I), 64% was born by NVD (Table 1).Table 2 shows the distribution of the neonates by Hypoxic Ischemic Encephalopathy classification. The majority of them belonged to the moderate HIE (59.8%). Only 3.1% belonged to the severe HIE. Table no 3 shows distribution of the neonates by outcome of development during discharge, at 3 month and at 6 month. Majority belonged to normal neurodevelopment during discharge (49.6%0, at 3 months (50.4%) and at 6 months (51.2%).Table no 4 shows the relationship between hypoxic ischemic encephalopathy and outcome of development during discharge, at 3 month and at 6 month. A statistically significant relationship was found between hypoxic ischemic encephalopathy and outcome of development during discharge (p=0.023) and at 3 month (p=0.018). Moderate significant relationship was found between hypoxic ischemic encephalopathy and outcome of development at 6 month (p=0.052).

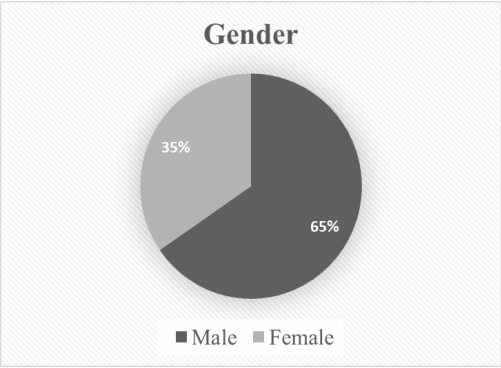

Figure 1: Gender of the neonates.

Table I: Mode of delivery of study patients (N=127).

Variable	Frequency	Percentage
Mode of delivery		
NVD	81	64
LUCS	46	36

Table II: Distribution of the respondents by Hypoxic Ischemic Encephalopathy classification (n=127).

Hypoxic Ischemic Encephalopathy	Frequency	Percentage
Mild	47	37
Moderate	76	59.8
Severe	4	3.1
Total	127	100

Table III: Distribution of the neonates by outcome of development during discharge, at 3 months and at 6 months (N=127).

Follow up	Frequency n (%)
During discharge	
Normal	63 (49.6)
Mild to moderate	16 (12.6)
Severe	48 (37.8)
At 3 months	
Normal	64 (50.4)
Mild to moderate	26 (20.5)
Severe	37 (29.1)
At 6 months	
Normal	65 (51.2)
Mild to moderate	21 (16.5)
Severe	41 (32.3)

Discussion

A total 127 neonates were analyzed of which male were 65%. Mild, moderate, and severe HIE was 37%, 59.8% and 3.1% respectively (Table I and III). This is similar to a study done by Bourel-Ponchel et al. [10] who found on 95 neonates with HIE, 38% were females, 62% were male and A study conducted in northern

Table IV: Relationship between Hypoxic Ischemic Encephalopathy classification and Outcome of development during discharge, at 3 months and at 6 months.

Hypoxic Ischemic Encephalopathy	Outcome of development during discharge				Test of significance
	Normal	Mild to moderate	Severe	Total	
Mild	31 (49.2%)	5 (31.3%)	11 (22.9%)	47	p=0.023(Fisher's exact test)
Moderate	32 (50.8%)	10 (62.5%)	34 (70.8%)	76	
Severe	0 (0%)	1 (6.3%)	3 (6.3%)	4	
Total	63	16	48	127	
Hypoxic Ischemic Encephalopathy	**Outcome of development at 3 month**				
	Normal	**Mild to moderate**	**Severe**	**Total**	
Mild	31 (48.4%)	10 (38.5%)	6 (16.2%)	47	p=0.018(Fisher's exact test)
Moderate	31 (48.4%)	16 (61.5%)	29 (78.4%)	76	
Severe	2 (3.1%)	0 (0%)	2 (5.4%)	4	
Total	64	26	37	127	
Hypoxic Ischemic Encephalopathy	**Outcome of development at 6 month**				
	Normal	**Mild to moderate**	**Severe**	**Total**	
Mild	31 (47.7%)	8 (38.1%)	8 (19.5%)	47	p=0.052(Fisher's exact test)
Moderate	32 (49.2%)	13 (61.9%)	31 (75.6%)	76	
Severe	2 (3.1%)	0 (0%)	2 (4.9%)	4	
Total	65	21	41	127	

Tanzania [11] found that majority of the new-born with HIE had mild HIE (50.8%) whereas only 10.2% had severe HIE. This study differed from a study done by Qureshi et al, it was found that 23.4%, 40.4%, 36.2% term neonates developed HIE stage I, II and III respectively [12]. At discharge, 3 months and 6 months of age RNDA was done in all neonates to see the outcome. Neurodevelopmental outcomes showed an overall improvement from discharge to 6 months, with normal development increasing from 49.6% to 51.2%. Mild-to-moderate impairment peaked at 3 months and then declined, while severe impairment or death decreased initially but rose again to 32.3% at 6 months, indicating late deterioration in some infants. Overall, although more than half achieved normal

development by 6 months, a substantial proportion continued to have significant neurodevelopmental challenges. Similar to this study by Khan et al., normal development was observed in 32%, mild impairments in 45%, and serious impairments in 23% [13]. Another study by Namusoke et all also showed similarity where author observed that majority (73.9%)) of new-born with HIE were discharged without short term complications by 1 week [14]. However, this study differ from a study in Bangladesh by Debnath B et all who found only 11.67% (7) neonate had normal development whereas development was mild, moderate and severe in 10%, 33.33% and 20% neonates, respectively [15]. Neurodevelopmental outcomes were significantly associated with the severity of hypoxic-ischemic encephalopathy (HIE) at discharge and at 3 months, with infants with moderate and severe HIE showing markedly higher rates of severe impairment or death compared to those with mild HIE ($p = 0.023$ and $p = 0.018$). By 6 months, this association became borderline significant ($p = 0.052$), indicating partial recovery over time, although adverse outcomes remained predominant in moderate and severe HIE. These findings are comparable to recent studies, such as Shankaran et al. and Azzopardi et al., which also demonstrated a strong severity-dependent gradient in outcomes, with mild HIE having favorable prognosis and moderate-to-severe HIE associated with persistent neurodevelopmental disability or death [16, 17]. A study by Hekimoglu et al found abnormal neurodevelopmental outcome in various domain in 29.4% of patients with moderate encephalopathy and in all patients with severe encephalopathy [18]. While Bithi et al. found, significant association between moderate to severe impairment/death with stage III of HIE (p value 0.01) [15].

This study provides valuable evidence from a tertiary care hospital in Bangladesh on the post-discharge neurodevelopmental outcomes of term neonates with hypoxic-ischemic encephalopathy managed at a tertiary-care pediatric hospital in a resource-constrained setting. Despite certain methodological limitations, these results may inform future program planning and stimulate further research aimed at improving neonatal encephalopathy care and health system capacity in similar low-resource contexts.

Conclusion

This study demonstrates that while favorable outcomes are common in mild HIE, moderate-to-severe HIE remains associated with substantial ongoing morbidity in low-resource settings. Strengthening early identification, implementing standardized neurodevelopmental assessments, and ensuring sustained follow-up services are essential for optimizing outcomes in high-risk neonates. Additionally, the findings provide a foundation for future research aimed at improving the care of neonates with hypoxic-ischemic encephalopathy in similar resource-constrained contexts.

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Ethical approval: The study was approved by the Institutional Ethics Committee.

References

1. Long M, Brandon DH. Induced hypothermia for neonates with hypoxic-ischemic encephalopathy. Journal of Obstetrics Gynecology Neonatal Nursing. 2007;36:293–298.

2. Lai MC, Yang SN. Perinatal hypoxic–ischemic encephalopathy. Journal of Biomedicine and Biotechnology.2010;2011:6

3. National Institute of Population Research and Training, Bangladesh Demographic and Health Survey, National Institute of Population Research and Training. 2018, Dhaka

4. Padayachee N, Ballot DE. Outcomes of neonates with perinatal asphyxia at a tertiary academic hospital in Johannesburg, South

Africa. S Afr J Child Health. 2013;7(3):89-94
5. Volpe JJ. Neurology of the newborn. 4th ed. Philadelphia: Saunders; 2008.
6. Miller SP, Ramaswamy V, Michelson D, Barkovich AJ, Holshouser B, Wycliffe N, et al. Patterns of brain injury in term neonatal encephalopathy. J Pediatr. 2005; 146:453-60
7. de Vries LS, Jongmans MJ. Long-term outcome after neonatal hypoxic-ischaemic encephalopathy. Arch Dis Child Fetal Neonatal Ed. 2010;(95): 220-24
8. Sarnat HB, Sarnat MS. Neonatal encephalopathy following fetal distress. A clinical and electroencephalographic study. Arch Neurol. 1976; 33:696-705.
9. Khan NZ, Muslima H, Begum N, Begum N, Shilpi AS, Batra M, Darmstadt GD. Reliability and Validity of a Structured Tool for Neurodevelopmental Assessment of 0-24 month Olds for use by Multiple Professionals in Bangladesh. Pediatrics. 2010 Apr;125(4):e755-62. Epub 2010 Mar 22.
10. Bourel- Ponchel E, Querne L, Flamein F, Ghostine G, Wallois F, Lamblin M. The prognostic value of neonatal conventional-EEG monitoring in hypoxic-ischemic encephalopathy during therapeutic hypothermia. Dev Med Child Neurol. 2023; 65:58–66. DOI: 10.1111/dmcn.15302
11. Simiyu IN, Mchaile DN, Katsongeri K, Philemon RN, Msuya SE. Prevalence, severity and early outcomes of hypoxic ischemic encephalopathy among newborns at a tertiary hospital, in northern Tanzania. BMC pediatrics. 2017;17(1):131
12. Qureshi AM, Rehman A, Siddiq TS. Hypoxaemic ischemic encephalopathy in neonates. J Ayub Med Coll Abbottabad 2010;22(4):109-3
13. Khan NZ, Muslima H, Begum D, Parveen M, Bhattacharya M,Begum N et al. Neurodevelopmental outcomes of preterm infants in Bangladesh. Pediatrics 2006; 118: 280–289.
14. Namusoke H, Nannyonga MM, Ssebunya R, Nakibuuka VK, Mworozi E. Incidence and short term outcomes of neonates with hypoxic ischemic encephalopathy in a Peri Urban teaching hospital, Uganda: a prospective cohort study. Maternal health, neonatology and perinatology. 2018 ;4(1):6.
15. Debnath B, Khan NZ, Mahfuz R, Mollah AH. Severity and immediate neurodevelopmental outcome in term neonates with hypoxic-ischemic encephalopathy admitted in NICU at a tertiary hospital in Bangladesh. Bangladesh Crit Care J. 2021 Mar;9(1):22-7. doi:10.3329/bccj.v9i1.53052.
16. .Shankaran S, Pappas A, McDonald SA, Vohr BR, Hintz SR, Yolton K, et al. Childhood outcomes after hypothermia for neonatal encephalopathy. N Engl J Med. 2012;366(22):2085–92. doi:10.1056/NEJMoa1112066. PubMed
17. Azzopardi D, Strohm B, Marlow N, Brocklehurst P, Deierl A, Eddama O, et al. Effects of hypothermia for perinatal asphyxia on childhood outcomes. N Engl J Med. 2014;371(2):140–49. doi:10.1056/NEJMoa1315788
18. Saygın Hekimoğlu B, Dilber B, Aktürk Acar F, Bezirganoğlu H, Eyüboğlu İ, Esenülkü G. Evaluation and Neurodevelopmental Outcomes of Infants with Hypoxic Ischemic Encephalopathy Treated with Therapeutic Hypothermia: A Single Center Experience. J Pediatr Acad 2022; 3: 104-109.

Original Article

Clinical Characteristics and Hematological Profiles of Hospitalized Children with Acute Respiratory Infections in a Tertiary Care Hospital

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Abstract

Background: Acute respiratory infections (ARIs) are the leading cause of pediatric hospitalization and morbidity, especially in low-middle income countries. In addition to clinical evaluation, regular hematological parameters might be useful for assessing the severity and prognosis of hospitalized children. **Objective:** To evaluate the clinical profile and hematological parameters among hospitalized children with acute respiratory infections and its correlation with the severity of illness in tertiary care teaching hospital. **Methods:** This was a hospital-based cross-sectional study involving 200 children with acute respiratory tract infection admitted to our hospital. Information of socio-demographics, clinical profile, diagnoses, hematological parameters and outcomes was obtained. Hematological studies consisted of levels of hemoglobin, total and differential white cell count, platelet count WBC (white blood cell) counts, a neutrophil-to-lymphocyte ratio (NLR). The severity of the disease was judged on need for oxygen therapy. **Results:** Most children were less than five years old and more commonly male. Cough, fever, and tachypnea were the most frequent presenting symptoms and pneumonia was the predominant diagnosis. Anemia, leukocytosis, neutrophilia and increased NLR were mostly common hematological abnormalities. Neutrophilia, leukocytosis, anemia and higher NLR were more common in children with severe disease who received oxygen treatment based on the analysis of non-severe cases. **Conclusion:** Hospitalized children with ARI frequently have significant hematological derangement which is associated with severity of the illness. Common hematological parameters, particularly the inflammatory markers like NLR might act as helpful adjuncts for early diagnosis of severe cases and barricade decision making when present in tertiary care hospitals.

Keywords: Acute respiratory infection; Children; Pneumonia; Hematological profile; Leukocyte count; Disease severity.

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Introduction

Acute respiratory infections (ARIs) are the most common diseases in children and a major cause of childhood hospitalization and death in developing countries. Acute respiratory infections, specifically lower respiratory tract infections (LRTIs) including pneumonia and bronchiolitis are a leading cause of death in children less than 5 years old -with low- and middle-income countries facing the largest

health burden according to WHO [1]. Although there have been impressive achievements in immunization, nutrition, and case management ARIs remain a major public health problem because of its high incidence rate, recurrence and severe consequences [2].

Pneumonia alone is responsible for an estimated 14–15% of under-five deaths worldwide each year, amounting to hundreds of thousands of preventable child deaths annually [3]. The burden of ARIs is also inequal by production environment with highest prevalence and severity in South Asia and sub-Saharan Africa where other factors such as undernutrition, indoor air pollution, overcrowding, poverty and lack of access to care-attention are involved [4,5]. Children with ARIs who are hospitalized in tertiary care hospitals typically represent the severe spectrum of disease, and close observation along with complex supportive measures are frequently needed.

Clinically, ARIs manifest in various forms among children: cough with or without fast breathing and/or chest indrawing, fever, fast breathing (respiratory rate ≥ 60b/min), difficult/rapid breaths (where the duration of a breath is twice that of normal), chest in-drawing, wheezing and hypoxemia. The disease can be mild or severe depending on age, nutritional status, immunization status and comorbidities [6]. Early recognition of severe disease is important as delayed detection and treatment is associated with the development of respiratory failure, sepsis, and extended hospital stay and death [7].

Hematologic laboratory tests are commonly requested on admitted children and have a clinical impact in the assessment of infectious diseases. Hemoglobin level, total leukocyte count (TLC), differential leukocyte count and platelet count are the parameters representing both host's pre-referral health status as well as the inflammatory response to infection [8]. Anemia is highly prevalent in children in LMIC and could exacerbate hypoxia and outcomes of clinical pneumonia among children [9]. In the same way, leukocytosis (≥10 × 109/L), neutrophilia or lymphopenia could reflect disease severity and systemic inflammatory response [10].

Simple inflammatory indices obtained from complete blood counts, such as the neutrophil–lymphocyte ratio (NLR) and platelet–lymphocyte ratio (PLR), have gained attention in recent years as possible indicators of disease severity and prognosis even for infectious diseases [11,12]. Such indices are cheap, easily accessible for most centers and especially valuable in low resource settings where advanced biomarkers may not be available. A few studies have proposed a raised NLR was related to severe pneumonia, requirement for ICU and poor outcome in children [13].

In addition to the high burden of ARIs, combined clinical features and hematologic profile data in hospitalized children are scanty from many tertiary care facilities. Knowledge of these trends may aid clinicians in the early identification and optimal treatment of high-risk patients [14, 15]. Thus, this study aimed to characterize the clinical manifestations and hematologic parameters of children hospitalized due to acute respiratory infections in a tertiary care teaching hospital and to investigate if there is any association between first-day hematology characteristics for degree of severity.

Methods

Study Design and Setting

The present was a hospital based observational study in the Department of Pediatrics of a tertiary care hospital. Children with a diagnosis of acute respiratory infection who were hospitalized in pediatric inpatient wards and at the pediatric intensive care unit (PICU) were eligible. The hospital is the

referral center for urban and rural patients. Information was gathered during the study period and covers consecutive eligible admissions.

Study Population and Inclusion Criteria:

The subjects were children with [i.e., phrase as 'ages was' not ages had] at the least 2 months and at the most 12 years of age, who were hospitalized for acute respiratory infection. Eligible cases were children with acute onset respiratory illness, (cough or difficulty in breathing and fast breathing) presenting at the clinic. Eligibility mandated for baseline clinical assessment and hematological work-up within 24 hours of admission. Children with chronic respiratory diseases, congenital heart disease, chronicle hematological disorders, recent blood transfusion or incomplete clinical or laboratory data were excluded from the study.

The Size of Sample as well as the Method of Sampling:

The sample size was standardized at 200 children, which was enough to explain the clinical presentation and hematological profile with reasonable precision in a single-center hospital-based study. Consecutive sampling method was employed where all the eligible children admitted during until the required sample size of 200 was obtained.

Data Collection and Variables:

Information was recorded using a structured case form. Socio-Demographics (Age, Sex, Address), clinical presentation (Cough, Fever, Fast breathing, Breathlessness and Chest in-drawing) to whom the physical examination was done and final diagnosis. The severity of the disease including oxygen demand, intensive care admission and duration of hospital stay was also recorded. Information was retrieved from patients' records and by direct clinical examination.

Hematological Investigations:

The hematology work-up was part of the patient's routine care. Blood sample obtained at admission were tested for determination of Hemoglobin (Hb) concentration, Total Leukocyte Count (TLC), Differential Leukocyte Count and Platelet count by autoanalyzer. The neutrophil–lymphocyte ratio was derived from the absolute number of neutrophils and lymphocytes. Age related reference ranges were considered in the interpretation of all hematological parameters.

Outcome Measures:

The main end point was severity of the disease, according to need of oxygen therapy and/or admission in a pediatric intensive care unit. Secondary outcomes measured were length of hospital stay, and clinical outcome at discharge which was reported as recovered or referred (including to isolation), and died.

Statistical Analysis:

The information was fed into a computer using statistical software. Socio-demographic, clinical and hematological parameters were summarized using descriptive statistics. Means ± standard deviations were calculated for continuous variables and medians with interquartile ranges, expressed as frequencies and percentages in case of categorical variables. The correlations between hematological indices with the severity of disease were evaluated employing required analyses. and the p-value less than 0.05 was considered significant.

Ethical Considerations:

Approval of the institutional review ethics committee was obtained before beginning the study. All participants gave written informed consent and the study was approved by our local research ethics committee according to the Declaration of Helsinki. We protected the confidentiality of patient information by dissociating all data, and parents or legal guardians of participants signed informed consent forms.

Results

Two hundred children with acute respiratory infections admitted to a hospital were enrolled. Most of the children were younger than 5 years which highlights a large burden of ARIs at an early age. The most common age group was below 12mo of age. The age of the study population averaged 28.6 ± 21.4 months. There was a distinct male preponderance, with a male to female ratio of about 1.4:1.

Geographically, most children resided in urban regions, corroborating the hospital's catchment population, with a significant percentage of patients from rural areas. Nutritional status was more than 50% of children were undernourished. Immunization status assessment showed that two-thirds of the children had been fully immunized for their age, yet a one-third were partially or not inoculated. Generally speaking, younger age, male sex, undernutrition and incomplete immunization were the socio-demographic characteristics found commonly among hospitalized children with acute respiratory infections.

Table I: Socio-demographic characteristics of hospitalized children with acute respiratory infections (n = 200).

Variable		Frequency n (%)
Age group	< 12 months	84 (42)
	12–59 months	77 (38.5)
	≥ 5 years	39 (19.5)
Sex	Male	118 (59)
	Female	82 (41)
Residence	Urban	121 (60.5)
	Rural	79 (39.5)
Nutritional status	Normal	88 (44)
	Undernourished	112 (56)
Immunization status	Fully immunized	132 (66)
	Partially/Unimmunized	68 (34)

Clinical Characteristics of Hospitalized Children

All the children of this series had acute respiratory manifestations at admission. The most common presenting symptoms were cough, seen in 192 (96.0%) of the children; fever in 168 (84.0%), and fast breathing in 154 (77.0%). Of these, 118 children (59.0%) presented with difficulty in breathing and 82 (41.0%) had chest indrawing. Hypoxemia (SpO_2 < 90%) was present on admission in 76 (38.0%) children.

Pneumonia (n = 122, 61.0%) was the most common diagnosis determined clinically and radiologically followed by bronchiolitis (n = 54, 27.0%) and other acute lower respiratory tract infections (ALRTIs) cases (n = 24, 12.0%). Altogether 68 (34.0%) of the children were given supplemental oxygen therapy at hospital.

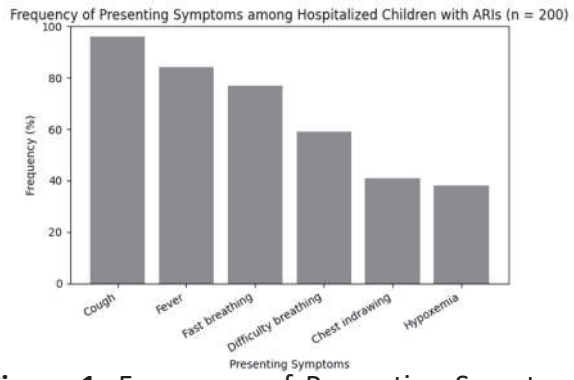

Figure 1: Frequency of Presenting Symptoms among Hospitalized Children with Acute Respiratory Infections (n = 200).

Hematological Profiles

Hematological anomalies were frequent in the hospitalized children. Anemia was found to occur in 116 (58.0%) and the rest, 84 (42.0%), had normal hemoglobin status. 108 (54.0%) children had leukocytosis, and 92 (46.0%) had a normal WBC count.

Leukocyte differentiation test shows neutrophilia in 104 cases (52.0%), lymphocyte predominance in 68 cases (34,0%). Platelet issues were rare; 62 children (31.0%) had thrombocytosis, whereas normal platelet levels were observed in 138 (69.0%). An elevated neutro-

phil–lymphocyte ratio (NLR) was reported in 98 children (49.0%) and was substantially more common in children with clinically severe disease.

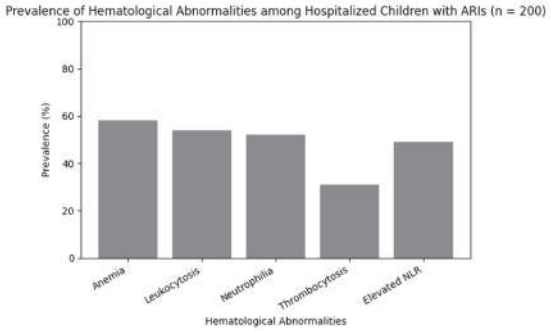

Figure 2: Prevalence of Hematological Abnormalities among Hospitalized Children with Acute Respiratory Infections (n = 200).

Association Between Hematological Parameters and Disease Severity

The severity of the disease was estimated by the need for oxygen. Hemoglobin and platelets were found to be significantly lower in 68 children who required oxygen therapy. Fifty-two (76.5%) oxygen-requiring children and 56 (42.4%) of those not requiring oxygen had leukocytosis. Neutrophilia was slightly more prevalent among severe (70.6%) than non-severe cases (42.4%).

Likewise, increased NLR was found in 60.3% of severe patients versus 43.2% of mild cases as well. Severe cases had a higher presence of anemia (67.6%) compared to those with non-severe conditions (52.3%). Our results demonstrate that inflammatory hematological parameters are related to clinical severity of ARI.

Treatment Outcomes

Most of the children got better with routine medical treatment and supportive care. A total of 176 children (88.0%) were discharged home when recovered. Eighteen children (9.0%) required transfer to a higher level of care or prolonged hospitalization, and 6 (3.0%) died from severe disease with associated complications. Median hospital stay lasted for 5 days (IQR: 3-7 days).

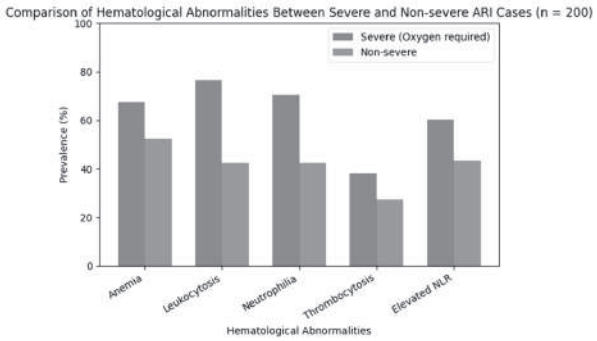

Figure 3: Comparison of Hematological Abnormalities Between Severe and Non-severe Acute Respiratory Infection Cases (n = 200).

Discussion

In this research, we report the clinical profiles and hematological parameters of children admitted with ARIs in a tertiary care teaching hospital and their relationship with severity of the diseases. The results indicated that ARIs mainly attack young children, especially children younger than 5 years with a significant male preponderance. This age and sex distribution is similar to previously described pediatric ARI admission age pattern, in keeping with an increased biologic susceptibility during early childhood as well as difference in-care seeking attitudes.

Regarding clinical manifestations, cough, fever and tachypnea were the most frequent presenting complaints and a significant proportion (>25%) of children presented chest indrawing and hypoxemia. Pneumonia was the most common diagnosis of hospitalized cases, followed by bronchiolitis. These findings emphasize that children admitted to hospital are usually at the more severe end of the spectrum of ARI cases, with frequent lower respiratory tract manifestations and associated impaired oxygenation.

Hematological disturbances were common among the studied population. Anemia (≤110 g/L) was present in over a half of children, likely reflects the high background prevalence of nutritional anemia among pediatric primaries and effects of acute illness. Anemia may

worsen tissue hypoxia in respiratory infections and could lead to worse clinical outcomes. Leukocytosis and neutrophilia were also frequent findings, especially in children diagnosed with pneumonia, suggesting an ongoing inflammatory process. Platelet changes (mostly thrombocytosis) were less frequent and probably reflect a reactive reaction to infection and inflammation.

Necessary, a distinct correlation was established between anthropometric parameters and severity of bisellium barites. Leukocytosis, neutrophilia, anemia and increased NLR were more common in children with the need of oxygen therapy compared to those without severe disease. Of these parameters, an increased NLR demonstrated the strongest correlation with illness severity, supporting its value as a readily available inexpensive inflammatory marker that could assist in early risk stratification. Given that NLR can be calculated from basic complete blood count, its application in resource-deprived scenarios without access to advanced biomarkers is particularly appealing.

The general prognoses were good and the majority of children recovered by conventional medical management and supportive treatment. Nevertheless, the existence of deaths and referrals among severe cases indicates the ongoing impact of ARIs and the importance of early identification of high-risk children. The combination of these simple clinical and laboratory parameters could help to inform the triage process whilst at the same time rationalize hospital care redistributing resources.

There are limitations to this study that should be taken in context with the results. As with all single-center hospital-based studies, our findings may not be representative of community settings and other healthcare institutions. Furthermore, etiological confirmation to viral or bacterial pathogens was not universally conducted and this restricts interpretation of hematological variation by infective agent. However, despite these limitations, the study offers valuable information regarding the clinical and hematological profiles in children with ARIs at a referral level of care.

In summary, the results underscore that routine hematological parameters along with clinical characteristics can provide valuable information for evaluating disease severity in hospitalized children with ARI.

Limitations

There are several limitations of this study that warrant a mention. First, the study was performed at a single tertiary care hospital and the generalizability to other health care settings or to patients recruited in the community is uncertain. Second, the use of hospital-based design might have included more severe cases of ARI and thus may overestimate the prevalence of clinical severity and hematology derangement compared with general pediatric children.

Third, the etiology (e.g., viral or bacterial organism) was not systematically ascertained. It was therefore not feasible to associate the hematological patterns to specific pathogens. Fourthly, the hematological parameters were only at admission; serial data lack to determine dynamic alteration of tests during illness or treatment.

Lastly, potential confounders like for example micronutrient deficiencies, underlying social-economic factors or previous treatment before hospital admission were not fully investigated. However, the study contributes important information on clinical and hematological profiles of children admitted to hospital with ARI, as well as areas requiring further research.

Conclusion

Children younger than five years of age continue to be hospitalized for acute respiratory infections. The present investigation shows that children hospitalized with ARI most frequently have LRT involvement/difficulty and signs of respiratory distress; pneumonia is the

commonest diagnosis. Hematological disorders, particularly anemia, leukocytosis, neutrophilia and high neutrophil–lymphocyte ratio were often detected.

The results show that the inflammatory hematologic parameters are common in children with severe disease who need oxygen therapy, whereas there is a significant correlation between the airway conductance and the severity of the disease. Simple hematological investigations have the advantage that they are available in most hospitals and hence could be useful as an adjunct to identify high-risk patients early on for any possible intervention strategies.

In conclusion, incorporation of the clinical assessment with basic hematological profile may be useful to manage children admitted with ARI. Large-scale multicenter studies, with etiology confirmation and longitudinal follow-up are needed to further confirm the results and generalize for other Chinese children.

References

1. World Health Organization. Acute respiratory infections in children. Geneva: WHO; 2020.

2. World Health Organization. Pneumonia in children. Geneva: WHO; 2023.

3. Liu L, Oza S, Hogan D, et al. Global, regional, and national causes of under-5 mortality in 2000–2019: an updated systematic analysis. Lancet. 2021;397(10285):1229–1241.

4. Troeger C, Blacker B, Khalil IA, et al. Estimates of the global, regional, and national morbidity, mortality, and aetiologies of lower respiratory infections in 195 countries, 1990–2016. Lancet Infect Dis. 2018;18(11):1191–1210.

5. UNICEF. Pneumonia: The forgotten killer of children. New York: UNICEF; 2019.

6. Rudan I, Boschi-Pinto C, Biloglav Z, Mulholland K, Campbell H. Epidemiology and etiology of childhood pneumonia. Bull World Health Organ. 2008;86(5):408–416.

7. McAllister DA, Liu L, Shi T, et al. Global, regional, and national estimates of pneumonia morbidity and mortality in children younger than 5 years between 2000 and 2015. Lancet Glob Health. 2019;7(1):e47–e57.

8. Kliegman RM, St Geme JW, Blum NJ, Shah SS, Tasker RC, Wilson KM. Nelson Textbook of Pediatrics. 21st ed. Philadelphia: Elsevier; 2020.

9. Pasricha SR, Drakesmith H, Black J, Hipgrave D, Biggs BA. Control of iron deficiency anemia in low- and middle-income countries. Blood. 2013;121(14):2607–2617.

10. Shah SN, Bachur RG, Simel DL, Neuman MI. Does this child have pneumonia? The rational clinical examination systematic review. JAMA. 2017;318(5):462–471.

11. Zahorec R. Ratio of neutrophil to lymphocyte counts—rapid and simple parameter of systemic inflammation and stress in critically ill. Bratisl Lek Listy. 2001;102(1):5–14.

12. de Jager CP, van Wijk PT, Mathoera RB, et al. The neutrophil–lymphocyte count ratio in patients with community-acquired pneumonia. PLoS One. 2012;7(10):e46561.

13. Huang Y, Liu A, Liang L, et al. Diagnostic value of blood parameters for community-acquired pneumonia in children. BMC Pulm Med. 2018;18:128.

14. Chisti MJ, Duke T, Robertson CF, et al. Co-morbidity: exploring the clinical overlap between pneumonia, sepsis, and severe malnutrition in children in Bangladesh. J Glob Health. 2015;5(2):020407.

15. Shi T, McLean K, Campbell H, Nair H. Aetiological role of common respiratory viruses in acute lower respiratory infections in children under 5 years. J Glob Health. 2015;5(1):010408.

Original Article

Clinical Profile and Postoperative Outcomes of Open Splenectomy: A Prospective Study of 15 Patients at Satkhira Medical College Hospital

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Abstract

Background: Globally, laparoscopic splenectomy has become the preferred surgical approach because of reduced postoperative pain, shorter hospital stays, and faster recovery. However, in many developing countries including Bangladesh, open splenectomy continues to be widely practiced due to limited availability of laparoscopic facilities, lack of trained manpower, and a high incidence of emergency trauma cases. **Objective:** To assess clinical indications, operative findings, and postoperative outcomes of open splenectomy at Satkhira Medical College Hospital. **Methods:** A prospective study including 15 patients, all treated by open splenectomy over a 12-month period. **Results:** Trauma accounted for 40% of cases, hematologic causes 60%. The overall complication rate was 20%, and no mortality occurred. **Conclusion:** Open splenectomy remains a safe and effective procedure with low morbidity in appropriately selected patients.

Keywords: Open splenectomy, post-operative outcome.

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Introduction

Splenectomy is a commonly performed surgical procedure in general surgery, indicated in both emergency and elective situations. Traumatic rupture of the spleen remains one of the leading causes for emergency splenectomy, especially in regions with high rates of road traffic accidents and limited facilities for non-operative management [3]. Elective splenectomy is frequently performed for hematological disorders such as immune thrombocytopenia, hereditary spherocytosis, and hypersplenism secondary to chronic liver disease, where splenic removal can lead to significant clinical improvement [4]. Although minimally invasive techniques are increasingly adopted worldwide, open splenectomy continues to play a crucial role in many hospitals in Bangladesh due to infrastructural limitations and patient-related factors. Emergency trauma cases often require rapid surgical intervention where laparoscopic facilities are unavailable. There is a scarcity of local data regarding the clinical profile, operative findings, and postoperative outcomes of open splenectomy from peripheral medical college hospitals. This prospective study was therefore conducted at Satkhira Medical College Hospital to evaluate the indications, intraoperative findings, and postoperative outcomes of open splenectomy, aiming to assess its safety and effectiveness in

a resource-constrained tertiary care setting.

Materials and Methods:

Study Site

• Department of Surgery, Satkhira Medical College Hospital (SMCH), Satkhira, Bangladesh.

Study Design & Duration

• Prospective observational study January 2023 - December 2023

Sample Size

This prospective observational study included a total of 15 patients who underwent open splenectomy during the study period from January 2023 to December 2023 at the Department of General Surgery, Satkhira Medical College Hospital. All eligible patients undergoing open splenectomy within this period were enrolled using a consecutive sampling method. Patients who underwent laparoscopic splenectomy or had incomplete surgical or follow-up data were excluded from the study

Inclusion Criteria

- Patients aged 12-70 years
- Indications requiring splenectomy (trauma or hematologic disorders)
- Open approach only

Exclusion Criteria

- Laparoscopic splenectomy
- Incomplete surgical or follow-up data

Data Recorded

- Demographic profile
- Indication for splenectomy
- Operative findings
- Postoperative complications
- Hospital stay
- Mortality

Results

A total of 15 patients underwent open splenectomy during the study period. The mean age of the patients was 35.2 ± 11.4 years, ranging from 12 to 70 years. There was a male predominance, with 9 males (60%) and 6 females (40%), giving a male-to-female ratio of 1.5:1. The majority of patients belonged to the young and middle-aged adult group, reflecting the higher incidence of trauma and hematological disorders in this population.

Table I: Demographic Characteristics of patients (n = 15).

Variable	Value
Mean age (years)	35.2 ± 11.4
Age range (years)	12-70
Male	9 (60%)
Female	6 (40%)
Male: Female	1.5:1

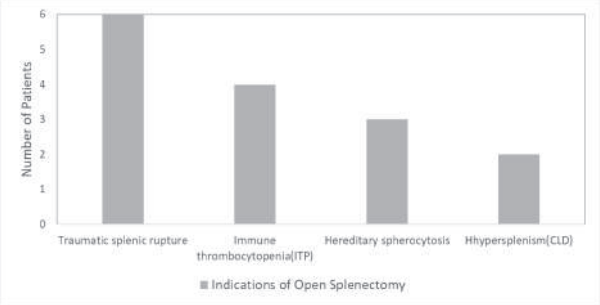

Figure 1: Indications of splenectomy.

Table II: Operative findings of patients (n = 15).

Operative finding	Value
Splenomegaly (>15 cm)	7 (46.7)
Hemoperitoneum (trauma cases)	6 (40)
Accessory spleen identified & removed	2 (13.3)

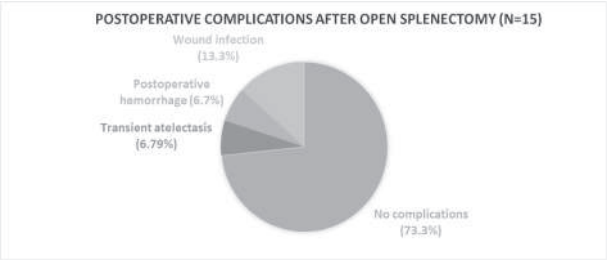

Figure 2: Postoperative Complications.

Discussion

The present prospective study evaluates the clinical profile and postoperative outcomes of open splenectomy performed at a tertiary care

hospital in a resource-limited setting. Despite the global shift toward laparoscopic splenectomy, open splenectomy continues to play a vital role in developing countries due to limited infrastructure, emergency trauma burden, and cost constraints. In this study, trauma was the most common indication for splenectomy (40%), followed by hematological disorders (60%). This distribution is consistent with regional and developing-country data, where road traffic accidents and blunt abdominal trauma remain leading causes of splenic injury [1,3]. Similar findings were reported by Uranus et al., who observed that trauma remains a major indication for open splenectomy, particularly in emergency settings where laparoscopy is not feasible [3]. The overall postoperative complication rate in the present study was 20%, with wound infection (13.3%) being the most frequent complication. This rate is comparable to previously published studies, which reported complication rates ranging from 18% to 30% following open splenectomy [1,4]. Gupta et al. documented a postoperative morbidity rate of 22% in patients undergoing splenectomy for hematological disorders, with wound-related complications being the most common [4]. Postoperative hemorrhage and transient atelectasis were observed in 6.7% of patients each. These complications are well-recognized after splenectomy and are usually related to extensive dissection, splenomegaly, and postoperative pain leading to poor respiratory effort [1]. The low incidence of respiratory complications in the present study may be attributed to early mobilization, adequate analgesia, and vigilant postoperative monitoring. Importantly, no mortality was recorded in this series. This finding aligns with several contemporary studies that report mortality rates below 2% for elective and usually emergency open splenectomy when performed in appropriately selected patients [3,4]. Davies et al. emphasized that meticulous perioperative care and early recognition of complications significantly reduce mortality after splenectomy [5]. The mean hospital stay in this study (6.5 ± 2 days) is comparable to other reports from similar healthcare settings, though it remains longer than laparoscopic series reported in high-income countries [2,3]. However, in emergency trauma cases and in patients with splenomegaly, open splenectomy remains unavoidable and effective.

Overall, the findings of this study reaffirm that open splenectomy is a safe and effective procedure in resource-limited settings, with acceptable morbidity and excellent survival when proper surgical technique and postoperative care are ensured.

Conclusion

Open splenectomy is a safe, effective, and essential surgical procedure at Satkhira Medical College Hospital, with low morbidity and no mortality. Strengthening perioperative care and ensuring vaccination protocols may further enhance patient outcomes.

References

1. Resende V, Petroianu A. The spleen and splenectomy. Int J Surg. 2013;11(3):148-51.

2. Di Sabatino A, Carsetti R, Corazza GR. Post-splenectomy and hyposplenic states. Lancet. 2011;378(9785):86-97.

3. Uranus S, Pfeifer J. Open vs laparoscopic splenectomy in trauma. Surg Endosc. 2012;26(1):208-14.

4. Gupta PK, et al. Outcomes after splenectomy in hematologic disorders. J Hematol. 2017;6(4):112-8.

5. Davies JM, et al. Management of post-splenectomy infections. Br J Haematol. 2011;155(3):308-17.

Original Article

Spectrum of Cardiac Diseases in the Coronary Care Unit of Satkhira Medical College Hospital, Satkhira

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Abstract

Background: Cardiac diseases remain a major health concern globally with atherosclerotic coronary artery disease (CAD) being one of the leading causes of morbidity and mortality. The Coronary care unit (CCU) at Satkhira Medical College Hospital serves as a critical facility for managing patients with acute and chronic cardiac conditions. This study aims to analyze the spectrum of cardiac diseases diagnosed and treated in the CCU, focusing on the most prevalent conditions and their clinical outcomes. **Methods:** A retrospective observational study was conducted on patients admitted to the CCU from 1st November, 2024 to 31st October, 2025. Patient data including demographics, clinical presentation, diagnostic investigations, and outcomes, were collected and analyzed. Diseases were classified according to ACC/AHA and ESC guideline. Descriptive statistics were used to summarize the data and pie charts, and clustered bar were used for categorical variables. **Results:** A total of 1359 patients were included in the study, among them 62% (n = 843) were male and 38% (n = 516) were female. Among them below 30 years 3%, 31 to 40 years 10%, 41 to 50 years 22%, 51 to 60 years 32%, 61 to 70 years 24%, and above 70 years 9%. The most common diagnosis was Acute coronary syndrome (includes ST-segment elevation myocardial infarction, non-ST-segment elevation and unstable angina), heart failure, cardiomyopathies (ICM, PPCM & DCM), valvular heart diseases, congenital heart diseases and arrhythmias (SVT, VT, AF). The average length of hospital stay was 7 days, with a mortality rate of 8%. Significant modifiable risk factors included hypertension 30%, diabetes mellitus 20%, dyslipidaemia 17%, obesity 15%, smoking 12% and thyroid dysfunction 6%. **Conclusion:** The study highlights the predominance of Acute coronary syndrome, heart failure and ischemic cardiomyopathy in the CCU, with high rates of comorbidities such as hypertension, diabetes and smoking. There is a need for targeted prevention strategies and improved management protocols to address the rising burden of cardiac diseases in this region.

Keywords: Acute coronary syndrome (ACS), Ischemic cardiomyopathy (ICM), Left atrial thrombus, Supraventricular tachycardia (SVT) and Ventricular tachycardia (VT).

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Introduction

Cardiovascular diseases (CVDs) are a significant cause of morbidity and mortality worldwide, with the burden continuing to rise, particularly in developing countries [1, 2]. The Coronary care unit (CCU) at Satkhira Medical College Hospital provides specialized care for patients with severe and acute cardiac conditions. The CCU's role in the timely management of conditions such as Acute coronary syndrome (ACS), heart failure, cardiomyopathies and arrhythmias, and is pivotal in reducing the mortality and improving the patient's outcome. The epidemiological shift in Bangladesh, marked by longer life expectancies and the rise of non-communicable diseases (NCDs), has amplified the burden of CVDs through widespread changes in diet, physical inactivity, tobacco use, and a greater incidence of hypertension and diabetes mellitus.

This study aims to evaluate the spectrum of cardiac diseases, demographic patterns, risk factors, complications and short-term outcomes of cardiac patients admitted to CCU at SMCH. By understanding the disease profile, healthcare planners can improve service delivery, strengthen emergency preparedness, introduce preventive community programs and optimizing local healthcare resource allocation.

Methods

This is a retrospective, observational study conducted in the CCU of Satkhira Medical College Hospital over a period from 1st November, 2024 to 31st October, 2025. A total of 1359 patients are included in this study.

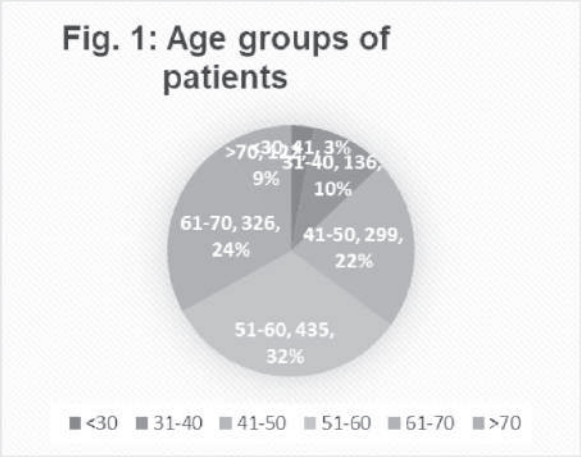
The inclusions criteria were patients of any age and sex admitted to the CCU during the study period. Diseases were classified according to ACC/ESC guideline, i.e. Acute coronary syndrome, heart failure, cardiomyopathies, valvular heart diseases, congenital heart diseases and arrhythmias. Structured pretested format was used to summarize the data, pie charts and clustered bar for categorical variables.

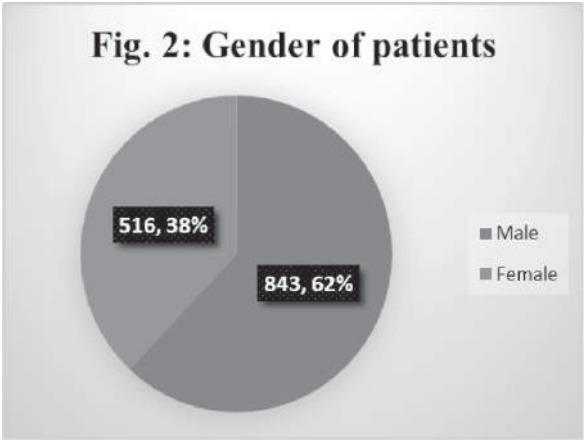
Exclusion criteria include patients admitted for non-cardiac conditions (e.g. trauma, anxiety, GERD, neuropathy) and patients transferred from other departments where initial diagnosis was not cardiac in origin.

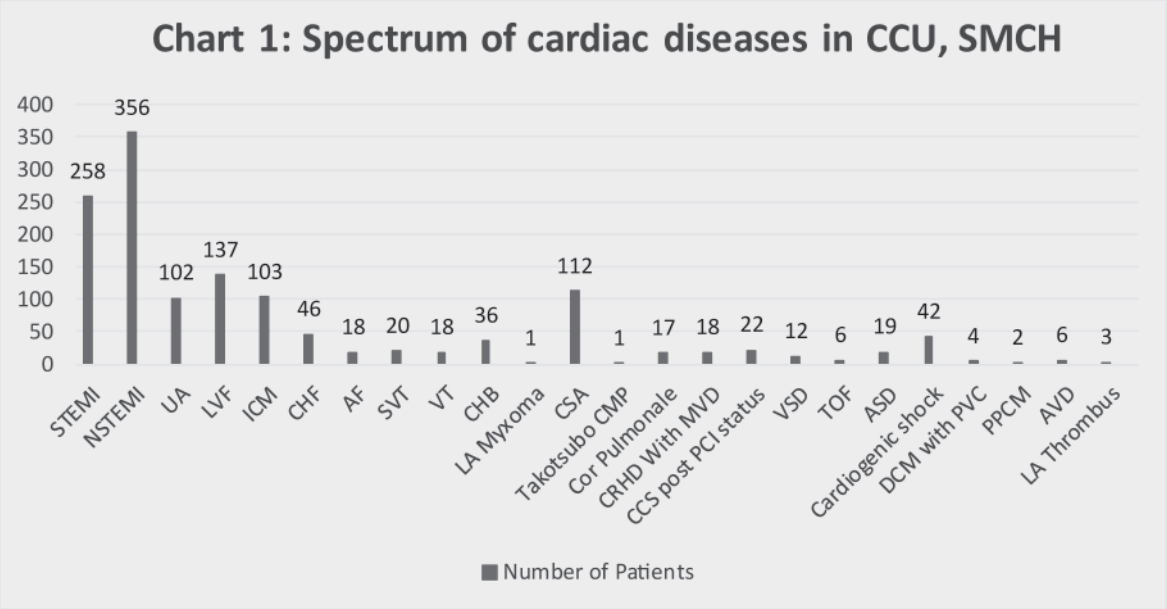
Results

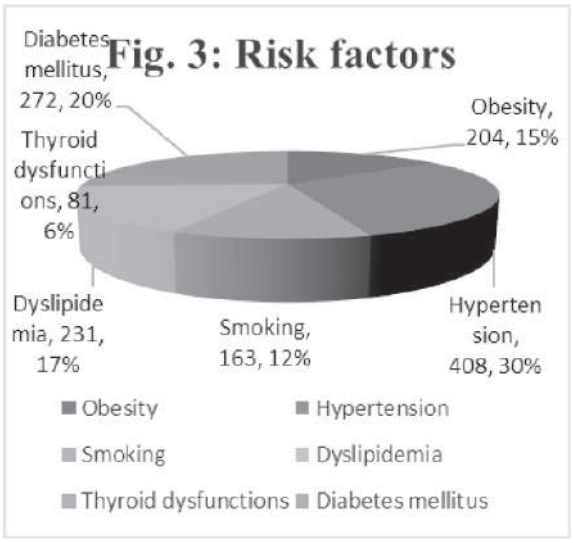
A total of 1359 patients were included, of whom 62% (n = 843) were male and 38% (n = 516) were female. Age distribution was: < 30 years (3%), 31–40 years (10%), 41–50 years (22%), 51–60 years (32%), 61–70 years (24%), and > 70 years (9%).

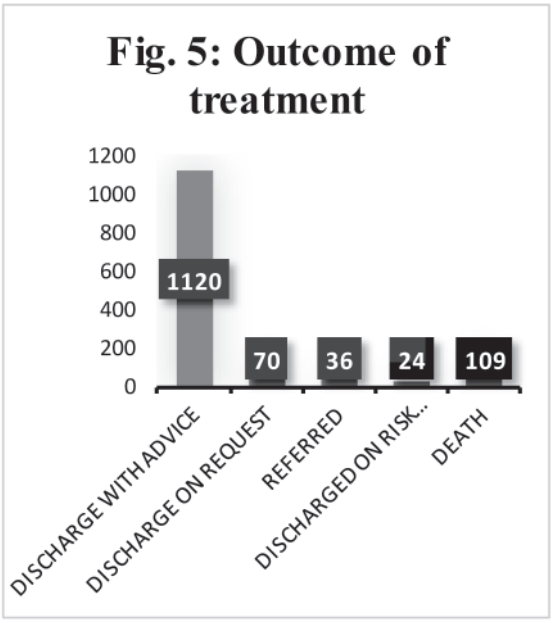
The average hospital stay was 7 days. Major modifiable risk factors included hypertension











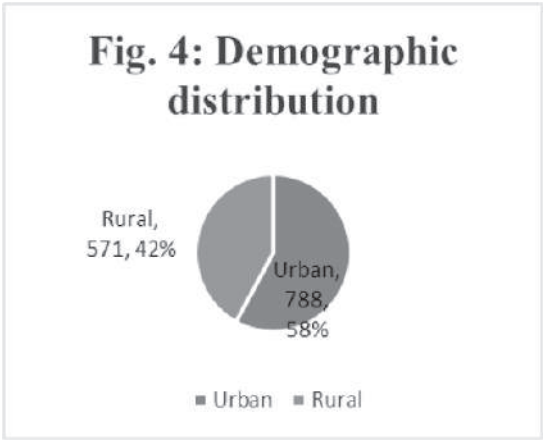


Table I: Diagnosis of the participants.

Diagnosis	Percentage
Acute coronary syndrome	52.68%
Heart failure	13.46%
Ischaemic cardiomyopathy	7.58%
Valvular heart diseases	1.77%
Congenital heart diseases	2.72%
Arrhythmias (SVT, VT, AF)	4.12%%
Others	17.67%

(30%), diabetes mellitus (20%), dyslipidaemia (17%), obesity (15%), smoking (12%) and thyroid dysfunction (6%). Patients of urban and rural areas were 58% (n = 788) and 42% (n = 571) respectively.

Out of a total of 1359 patients, there were 109 deaths, giving an overall mortality rate of 8.0%. The causes of death were cardiogenic shock due to ACS: 59.6% (n = 65), heart failure: 20.2% (n = 22), arrhythmias: 13.7% (n = 15) and others 6.5% (n = 7).

Discussion

The findings of this study highlight the high prevalence of ACS, heart failure, cardiomyopathies, chronic rheumatic valvular heart diseases and congenital heart diseases in the CCU of Satkhira Medical College Hospital. These conditions align with global trends, where ACS continues to be a leading cause of hospitalization in the CCUs complicated with shock, LVF, uncontrolled diabetes and CKD had increased risk of in-hospital mortality [1]. The burden of CVDs in the South Asians is expected to be doubled in next 20 years [2, 3]. High rates of ACS relate with high prevalence of hypertension from saline water, widespread smoking, lack of preventive care, limited awareness about ACS symptoms. Proportion of those with CAD was found higher beyond the age of 30 years [4]. These findings are consistent with literature and poor emergency transport networks. Mortality was strongly associated with cardiogenic shock due to STEMI, heart failure and ventricular arrhythmias. In Eastern Europe and much of Asia, the rates of CAD are rapidly rising [1]. Another study conducted in order to determine the burden of CAD reported similar findings [1]. Patients of CAD in rural area are slightly lower than urban counterparts, similar to the study [2].

Conclusion

This study provides valuable insights into the spectrum of cardiac diseases in the CCU of Satkhira Medical College Hospital. The high prevalence of ACS, heart failure and ICM emphasizes the need for targeted prevention, early detection, and management strategies including Cath Lab set up with skilled intervention manpower. Further studies including prospective designs, are needed to understand the evolving trends in cardiac care and improve patient outcomes in this region.

References

1. World Health Organization. Cardiovascular diseases (CVDs)[online].2012[citedon2012 Nov28]. Available from URL:http://www.who.int/mediacentre/factsheets /fs317/ en/index.html

2. World health organization, International statistical classification of diseases and related health problems 10th revision version for 2007 [online]. 2012 [cited 2012Nov28]. Available from URL: http://apps.who.int/classifications/apps/icd/icd10online.

3. Cader FA, Kabir CS, Nasrin S, Amin MN, Haq MM. Predictors of In-hospital Mortality in Patients Presenting with Acute Coronary Syndromes in a Tertiary Cardiac Center in Dhaka, Bangladesh. Mymensingh Med J. 2022 Oct;31(4):1057-1067.

4. Abegunde DO, Mathers CD, Adam T, Ortegon M, Strong K. The burden and costs of chronic diseases in low-income and middle-income countries. Lancet 2007;370:1929-38.

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