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Editorial

Application of Medical Ethics in Clinical Practice: Current Perspective

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Medical ethics is a code of conduct in order to render the best possible service to the humanity and to maintain the honor and dignity of the members of the medical profession. Ethics is a science of moral values or principles. Medical ethics is indeed the foundation for upholding professionalism, integrity, and compassion in healthcare. It encompasses a set of moral principles guiding healthcare providers in their relationships with patients, colleagues, and society at large. At its core, medical ethics promotes key values like beneficence (acting in the patient's best interests), non-maleficence (avoiding harm), autonomy (respecting patients' right to make informed decisions about their care), and justice (providing fair and equitable treatment).[1] By following these ethical principles, healthcare professionals are better equipped to navigate complex situations and make decisions that honor the trust placed in them by society. However, ethical dilemmas often arise, influenced by advances in technology, changes in patient expectations, and the complexities of healthcare systems. Ethical practice not only protects the rights of patients but is also a safeguard of medical practitioners. Today's physicians face complex challenges that require careful ethical consideration, including data privacy, end-of-life care, and disparities in access to treatments. These issues emphasize the need for ongoing ethical reflection and education within the medical profession, helping physicians make informed, compassionate decisions that promote fairness and respect for patient rights.

The history of medical ethics ushered since the code of Hummurabi about 2200 BC. The Greek physician Hippocrates declared an oath known as Hippocratic oath within 460 to 377 BC. Medical practice worldwide over and above the Hippocratic Oath is governed by normative or moral philosophical theories as enshrined in (contemporary) medical ethics. In the medieval and early modern period, the field is indebted to Islamic scholarship such as Ishaq ibn Ali al-Ruhawi (who wrote the Conduct of a Physician, the first book dedicated to medical ethics), Avicenna's Canon of Medicine and Muhammad ibn Zakariya ar-Razi (known as Rhazes in the West).[2] The modern principles of medical ethics were prepared by Thomas Percival in 1803. Lastly Geneva declaration was declared in 1948 and was accepted by the general assembly of the world medical association in London on October 12, 1949. Till this day, we are abiding by those points of Geneva declaration.[3] In ancient civil society, medical ethics was applied according to Hippocratic Oath. With the change of time, codes of conduct, laws have been upgraded. Now a days, medical ethics is a basic module of medical curriculum at the institutes of developed countries like USA, Canada, and many European countries.[4] In Bangladesh, the Bangladesh Medical and Dental Council (BMDC) regulate the discipline in relation to misconduct, malpractice, negligence, in medical practice.[1] According to BMDC guideline: Disregard of professional responsibility to patient, such as gross negligence in respect to his professional duties to his patient may be regarded as misconduct sufficient to justify the suspension or the removal of the name of a medical practitioner from the register. The Medical and Dental Council Act, section 28 provides that if any registered medical/ dental practitioner has been convicted of any criminal offence, or after due enquiry, found guilty of infamous conduct in any professional respect by the council, the council may in its discretion direct the removal of the name of the medical practitioner from the register.[2] The word convicted is obviously used in relation to a duly constituted court.

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Glimpse of Ethical Medical Practice Guideline for physicians: According to Bangladesh Medical and Dental Council (BMDC) audience 2010: A doctor must keep his professional knowledge and skills up to date, refine & develop his clinical judgment as he gains experience. A doctor should assess a patient's condition adequately by taking detailed history, doing relevant physical examinations, be rational in advising investigations, prescribing medicines & performing any operative procedures where necessary. A doctor should be a good listener & give his patient reasonable & enough time for the brief narration of his ailment as patient's satisfaction is the absolute concern here. A doctor is expected to show the utmost empathy & compassion towards his patients. A doctor will prioritize & attend his patients according to their clinical needs unavoidable emergencies. A doctor should not discriminate his patients in terms of cast, creed, religion, gender, disability, financial condition, ethnicity, nationality or political bias. A doctor should respect and maintain the privacy of a patient during physical examination & must provide necessary means to cover the patient from other persons while examining, especially the private parts of the patient even while undergoing an operative procedure. A doctor must ensure and explain all the details preceding any physical examination or operation. Before any invasive or non-invasive procedure that a doctor needs to be assured about for the purpose of teaching, research, or treatment, informed written consent or other legitimate permission must be obtained. A doctor must not disclose any information with others regarding the ailment of his patient, without seeking his/her permission unless it is counted as medico-legal issue & he should also keep all information confidential. A doctor should not interfere in the family affairs or private life of his patient unless there is a professional reason to do so. A doctor should consider adequate counselling of his patient for giving proper visualization of his ailment, available treatment modalities along with the disease prognosis. A doctor should give the opportunity to his patient to clarify the questions or refuse any intervention & treatment after expressing his medical opinion with the greatest possible clarity. It is the duty of a physician to ensure possible least amount of suffering when a patient's death is imminent. This includes attending to the physical, emotional, social, and spiritual needs of a terminally ill patient. Whenever necessary a doctor should refer the patient to other specialist for either diagnostic or therapeutic services.

A doctor must not accept any financial or other inducement from any person or organization (diagnostic laboratories, hospitals, nursing homes) for the referral of a patient regarding consultation, investigations or treatment. Without any contract or liabilities or any compulsion, nominal gifts/products given by the pharmaceutical company for publicity purpose can be accepted. A doctor when prescribing should only choose the medicine or appliance which, in his professional judgment & considering cost effectiveness, will best serve the medical interests of his patients. A doctor must not associate himself with a non-qualified person in providing any form of healing or treatment for his patients. Doctor's society or organization can take non-compulsion support from any pharmaceutical company & allied industries for the arrangement of CME (Continuing Medical Education) or other academic symposium. A doctor should not mention anything in his/her profile which is not legally or professionally accredited. It is unethical for a doctor to make unjustifiable comments which, whether directly or by implication, undermines trust in the professional competence or integrity of another doctor. While attending a female patient, a male doctor is supposed to be accompanied by a female attendant or relatives of the patient.[5]

By grounding practice in ethical principles, healthcare professionals can uphold the dignity, trust, and honor that define their profession. In a time of rapid change, these ethical foundations provide a steady framework, reminding that the true measure of medical progress lies not just in scientific achievement but in compassionate, principled care.

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Original Article

Pattern of Substance Abuse among Professional Drivers and Job Seekers in Bangladesh

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Abstract

Background: Drug abuse is a significant public health concern in Bangladesh, particularly among vulnerable populations such as professional drivers and job seekers. The high mobility and stress associated with these occupations may contribute to increased substance use, affecting their health, safety, and productivity. ***Objective:*** This objective of the study to assess the prevalence of drug abuse among professional drivers and job seekers in Bangladesh and identify associated factors influencing substance use patterns in these groups. ***Methodology:*** This cross-sectional study was conducted at the Department of Biochemistry at National Institute of Laboratory Medicine & Referral Centre (NILMRC), Dhaka, Bangladesh from July 2022 to December 2022. Urine samples (n = 91,745) were collected from professional drivers and job seekers and screened for drug metabolites using 5-panel rapid test cassettes. Positive samples were further analyzed quantitatively. ***Results:*** Among the positive cases, 3% tested positive for drug abuse. The most commonly detected substance was cannabinoids (90.89%), followed by benzodiazepines (5.8%), amphetamines (1.35%), opiates (1.13%), and alcohol (0.8%). Drug use was most prevalent in individuals aged 25-34 years (35.62%), followed by those aged 35-44 years (34%). A strong correlation was observed between drug use and gender, with 99.93% of positive cases being male. Significant associations were found between drug use and both age and gender ($p < 0.05$). ***Conclusion:*** This study underscores the high prevalence of cannabinoid use among younger male drivers in Bangladesh, highlighting the need for targeted interventions to reduce drug abuse and enhance road safety. Future research should investigate underlying causes and prevention strategies.

Key Words: Drug abuse; Professional drivers; Job seekers; Bangladesh

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Introduction:

The prevalence of drug abuse has become a critical global health issue, affecting both developed and developing countries. Numerous reports suggest that the rate of raddiction to psychoactive substances, including cocaine, amphetamine-like stimulants, and synthetic drugs is increasing worldwide. Among these substances, synthetic

cannabinoids, also referred to as designer or recreationaldrugs, have gained particular prominence due to their potent psychoactive effects and ease of access. This surge in substance abuse not only threatens public health but also endangers public safety, particularly in high-risk environments such as road transportation. In Bangladesh, where road traffic accidents are frequent and often fatal, the connection between drug abuse and impaired driving has raised significant concerns.

The relationship between drug abuse and road traffic accidents is well-established. Studies have shown that drivers under the influence of drugs are at a much higher risk of being involved in serious or fatal accidents compared to sober drivers. This is particularly alarming in Bangladesh, a nation experiencing rapid urbanization and population growth, where road safety has become a pressing issue. It is estimated that approximately 6 million people in Bangladesh are addicted to drugs, with 80% of these individuals being adolescents and young adults aged 15 to 30 years. This overlap between the demographic profile of drug addicts and the typical age of drivers raises serious safety concerns, as drug abuse is known to impair critical cognitive and motor functions necessary for safe driving.[1] Drug abuse, which includes the misuse of both illegal drugs and medically prescribed medications, significantly disrupts brain function, resulting in impaired judgment, slower reaction times, and reduced motor coordination all of which are crucial for driving and workplace. Commonly abused substances include amphetamines, cannabis, opioids, benzodiazepines, and alcohol. Cannabis, in particular, is the second most widely used drug globally after alcohol and is a leading cause of impaired driving. Despite the global data, there is little specific information about the number of drug-addicted drivers in Bangladesh. However, anecdotal evidence from the transport industry suggests that a large proportion of public transport drivers in Dhaka—who operate approximately 50,000 vehicles—may be using drugs. A recent survey conducted by private organizations found that nearly 80% of drivers tested positive for drug use, highlighting the severity of the issue.[2] Many drivers report that drug use helps them cope with the physical and psychological demands of their work. Long hours, high temperatures, and constant stress—combined with the chaotic traffic conditions in Dhaka—drive many of these individuals to use substances to maintain concentration and energy levels. The widespread belief among drivers is that drugs enhance their focus and enable them to endure the pressures of their jobs, despite the significant risks to their own safety and the safety of others on the road.[3]

In response to the growing concern about drug-impaired driving, the Government of Bangladesh has implemented several measures to address the problem. As of January 30, 2022, the Bangladesh Road Transport Authority (BRTA) introduced mandatory drug testing, commonly referred to as the DOPE test, for all professional drivers prior to issuing or renewing their driving licenses. Drug test is also mandatory for all job candidates as a part of health check-up since 2021 as because, number of drug abusers are increasing due to various familial disharmony, lack of support and availability of drugs among civil population.[4] These initiatives are a part of a larger strategy aimed at reducing drug-related traffic accidents and improving overall road safety and reduce social crime, violence, and additional healthcare cost. However, despite these efforts, there has been no large-scale, nationwide study conducted to assess the prevalence of drug use among professional drivers in Bangladesh. Such data is vital for understanding the scope of the problem and developing targeted interventions to reduce drug use within these high-risk population.[5] The present study aims to investigate the prevalence of drug abuse among professional drivers and job seekers in Bangladesh.

Methodology

Study Settings and Population: This cross-sectional study was conducted at the Department of Biochemistry, National Institute of Laboratory Medicine and Referral Center (NILMRC), Sher-e-Bangla Nagar, Dhaka, from July 2022 to December 2022.

Sample Collection: A total of 91,745 urine samples were collected from February 2022 to December 2022. The majority were from professional drivers referred by the BRTA for mandatory drug testing as part of the government's road safety initiative. Government job seekers from the civilian population were also included in the data collection. Urine samples were collected at the Department of Biochemistry, NILMRC, where participants provided their national identification cards and BRTA reference documents for verification. Civil population and Drivers were instructed to provide urine samples in a secure, controlled environment devoid of potential adulterants.

Laboratory Assays: Urine samples were analyzed to detect a panel of commonly abused drugs, including amphetamines, benzodiazepines, cannabinoids, opioids,

and alcohol metabolites. Testing was performed using multi-drug 5-panel rapid test cassettes (urine), a rapid chromatographic immunoassay based on the principle of competitive binding. The test kits were sourced from Acro Biotech, Inc., China. The initial test was a qualitative screen to detect the presence of drug metabolites. For samples that returned positive results, a more precise quantitative analysis was performed using the Indiko Plus semi-automated analyzer. semi-automated analyzer uses homogeneous enzyme immunoassay methods to quantify drug metabolites in the urine. Positive samples were stored at -20°C for one month for potential re-testing or further analysis if required.

Specimen Processing and Laboratory Safety: All laboratory work was conducted in the Department of Biochemistry at NILMRC. Universal precautions were strictly followed throughout the specimen handling process. This included wearing appropriate personal protective equipment (PPE) such as gloves and laboratory coats when handling urine samples. Contaminated materials, including urine collection tubes and gloves, were disposed of in biohazard bags. All work surfaces were disinfected after each session, and thorough hand washing was carried out after the removal of PPE.

Statistical Analysis: Data were collected via the hospital's online server. Following data cleaning and editing, analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistics were used to summarize demographic data and prevalence rates. Inferential statistics, including chi-square tests, were used to assess the association between drug use and demographic characteristics such as age and gender. P-values less than 0.05 were considered statistically significant. Data were presented in tables and graphs where appropriate to enhance interpretability.

Ethical Consideration: This study is approved by Institutional Review Board of NILMRC (2024.0202).

Results

A total of 91,745 urine samples were collected and among these, 2,734 (3%) tested positive for drug abuse. The most commonly detected substance was cannabinoids, followed by benzodiazepines, amphetamines, opiates, and alcohol. The different substances were detected among the 2,734 positive cases. The most frequently abused substance was cannabinoids (90.89%), with benzodiazepines accounting for 5.8%, amphetamines for 1.35%, opiates for 1.13%, and alcohol for 0.8%. The results clearly indicate that cannabinoids were the most commonly abused drug among drivers, representing the majority of positive tests. Alcohol and opiates were the least detected substances (Table 1).

Table 1: Distribution of Drug Abuse by Substance Type

Drug/ Substance Type	Frequency	Percent	P value
Cannabinoids	2,485	90.9	< 0.001
Benzodiazepines	159	5.8	0.004
Amphetamines	37	1.3	0.021
Opiates	31	1.1	0.045
Alcohol	22	0.8	0.053

The majority of cases were found among individuals aged 25-34 years (35.62%), followed by those in the 35 to 44 years age group (34%). Younger individuals (below 25 years) accounted for 10.91% of positive cases. Drug use was most prevalent among younger individuals, particularly those aged 25-34 years, indicating a concentration of drug abuse in younger demographics. The lowest prevalence was observed in individuals over 65 years of age (0.99%) (Table 2).

Table 2: Distribution of Drug Abuse by Age Group

Age Group	Frequency	Percent	P value
<25 Years	298	10.9	0.032
25 to 34 Years	974	35.6	< 0.001
35 to 44 Years	930	34.0	< 0.001
45 to 54 Years	390	14.3	0.011
55 to 64 Years	115	4.2	0.045
>65 Years	27	1.0	0.078
Total	2734	100.0	-

Of the 2,734 cases, 2,732 (99.93%) were male drivers, while only two female cases tested positive for drug use, both of whom were part of the civil population. The overwhelming majority of positive cases were male, suggesting that men are at a much higher risk of drug abuse, particularly among professional drivers. This pattern underscores the need for male-targeted interventions in addressing drug use. The Pearson correlation analysis also demonstrated a strong positive correlation between gender and drug use ($r = 0.62$, $p < 0.001$), indicating that males are significantly more likely to test positive for drug abuse than females. The strong correlation between male gender and drug use highlights that drug prevention programs should prioritize male drivers, especially in high-risk categories such as professional drivers. A Pearson correlation analysis was conducted to assess the relationship between age and substance use. The results revealed a moderate positive correlation between age and cannabinoid use

($r = 0.45$, $p < 0.01$). However, no significant correlation was observed for other substances. The data suggest a significant correlation between younger age and cannabinoid abuse (Table 3).

Table 3: Pearson Correlation of Age and Drug Abuse

Variable	Correlation Coefficient (r)	P value
Age vs. Cannabinoids	0.45	<0.01
Age vs. Benzodiazepines	0.12	0.13
Age vs. Amphetamines	-0.03	0.72
Age vs. Opiates	0.05	0.60
Age vs. Alcohol	-0.02	0.82

Discussion

The results indicate that cannabinoids were the most frequently abused substance, accounting for 90.89% of positive cases. This finding aligns with previous studies that identified cannabinoids as a dominant drug of abuse, particularly among younger populations.[6,7] Benzodiazepines were the second most common, but their prevalence (5.8%) was significantly lower than that of cannabinoids. Amphetamines, opiates, and alcohol were the least detected substances, contrasting with findings from other regions, where alcohol is often a leading substance in driver-related drug abuse.[8,9] The high prevalence of cannabinoids suggests the need for targeted interventions. Cannabis abuse among drivers is associated with impaired driving skills, slower reaction times, and a heightened risk of accidents, as reported in prior research[10,11]. Therefore, focusing on cannabis in awareness campaigns and implementing stricter regulations could significantly impact reducing drug-related driving incidents. This study found that drug abuse was most prevalent among individuals aged 25-34 years (35.62%), closely followed by those in the 35-44 years age group (34%). These findings are consistent with other studies that have reported higher drug use rates in younger adults, particularly those aged 20-40 years.[12] The correlation between younger age and substance use, especially cannabinoids ($r = 0.45$, $p < 0.01$), emphasizes the importance of focusing prevention programs on this demographic. Studies from various regions have similarly highlighted that younger drivers are more likely to engage in risky behaviors, including drug use.[13,14] In contrast, drug abuse was less common in individuals aged 55 years and above, consistent with global trends indicating lower drug consumption rates in older populations.[15] This age-based pattern could be attributed to increased responsibilities, lifestyle changes, and reduced peer pressure as individuals age. The data reveal a striking gender disparity in drug abuse, with 99.93% of positive cases occurring in males. This finding aligns with several other studies reporting higher rates of drug abuse among men, particularly in high-risk professions such as driving.[16] The strong correlation between male gender and drug abuse ($r = 0.62$, $p < 0.001$) underscores the need for gender-specific interventions, particularly among male drivers who may be at higher risk of substance abuse due to the stresses and demands of their occupation.[17,18] Moreover, the fact that the two female cases identified were part of the civil population, and not from the BRTA-referred drivers, suggests that professional female drivers might either be less likely to engage in drug use or underrepresented in this sector. Studies from other regions have also found lower drug abuse rates among females in the transport industry.[19,20]

The Pearson correlation analysis between age and cannabinoid abuse ($r = 0.45$, $p < 0.01$) indicates a moderate positive relationship, confirming that younger individuals are more likely to abuse cannabinoids. This finding is supported by existing literature identifying youth as a major risk factor for cannabis use.[21,22] In contrast, no significant correlations were found between age and other substances such as benzodiazepines, amphetamines, or opiates, suggesting these substances may be used more uniformly across age groups or may not be as prevalent among younger individuals in this population. The gender correlation analysis ($r = 0.62$, $p < 0.001$) further highlights the disproportionate impact of drug abuse among males, particularly in driving professions. These findings are consistent with global data on gender and substance abuse, which frequently show higher usage rates among males.[23]

The findings of this study are largely consistent with other regional studies, although notable differences exist. For instance, a study conducted in South Asia reported alcohol as one of the most commonly abused substances among drivers, contrasting with our finding that alcohol was the least detected substance.[24] This discrepancy may be attributed to cultural and religious factors in Bangladesh, where alcohol consumption is less socially accepted compared to other regions.[25] In terms of age distribution, our results echo studies from Western countries, where younger adults are more likely to engage in substance use.[26] However, the specific dominance of cannabinoids may reflect a more localized trend in Bangladesh that warrants further exploration through longitudinal studies.

Conclusion

In summary, this study highlights the high prevalence of cannabinoid abuse among professional drivers and job seekers in Bangladesh, particularly in younger males. The findings emphasize the need for targeted interventions that address the specific risks associated with drug abuse in this population. Future research should explore the underlying factors driving these trends and develop strategies to mitigate the impact of drug abuse on road and social safety. The findings of this study have several important implications for policy and public health interventions. First, the dominance of cannabinoids suggests that targeted prevention programs focusing on cannabis use should be prioritized. These could include public awareness campaigns aimed particularly at younger drivers and regular screening programs for professional drivers. Additionally, the stark gender disparity points to the need for male-targeted interventions. Educational initiatives that address the risks of drug abuse, particularly in high-stress professions such as driving, should be a key component of future prevention efforts. Finally, the strong age and gender correlations suggest that risk factors for drug abuse are not evenly distributed across the population. This calls for tailored interventions that address specific demographic groups, focusing on younger males who are most at risk.

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Original Article

Knowledge and Practices of Retail Drug Sellers on the Rational Dispensing of Antibiotics

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Abstract

Background: Retail drug pharmacies are often the primary and sometimes the sole source of healthcare for many patients in developing countries. The nonprescription selling of antibiotics is a major contributor to the rise in antibiotic usage, hastening the emergence of drug resistance. Bangladesh, as a developing country with a growing economy, is currently facing the global health threat of antibiotic resistance. **Objective:** The purpose of the present study was to assess the levels of knowledge and practices of retail drug sellers regarding the rational dispensing of antibiotics. **Methodology:** This cross-sectional study was conducted from January to December 2018 to evaluate the levels of knowledge and practices among the conveniently selected 294 retail drug sellers regarding the rational dispensing of antibiotics. Pharmacies were purposively selected from the Fatulla and Narayanganj Sadar Narayanganj districts of Dhaka, Bangladesh. **Results:** Most retail drug sellers had an average level of practice (68.3%), in contrast to the majority had good knowledge level (94.5%). Compared to older dealers (aged 41-60); younger sellers (aged 21-40) were significantly more likely to prescribe antibiotics without a prescription. On the contrary, retail drug sellers with a higher daily client volume were significantly more likely to dispense antibiotics without a prescription than those with fewer clients. **Conclusion:** This study revealed that while most retail drug sellers had a good level of knowledge, the majority demonstrated only an average level of practice.

Key Words: Knowledge; practices; retail drug sellers; rational dispensing of antibiotics; Bangladesh

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Introduction:

Bangladesh satisfied the requirements to be ranked as a developing country in 2018.[1] One of the criteria for maintaining this development process is health.[2] Despite significant achievements in primary healthcare, Bangladesh faces several health challenges, with antibiotic resistance being perhaps the most alarming.[3] The ability of microorganisms (including bacteria, viruses, and some parasites) to withstand the effects of antimicrobial agents (such antibiotics, antivirals, and antimalarial) is known as antibiotic resistance. As a result, infections continue to exist and may even spread to other people, rendering conventional therapies useless.[4] Antimicrobial resistance has many causes, which can be broadly categorized into two main types: microbial and human causes. The most significant

human factor is the irrational use of antibiotics, including self-medication, improper dosing and duration by patients, and the sale of antibiotics without a prescription or proper caution by drug sellers. One of the primary contributors to this problem is the non-prescription purchase of antibiotics or self-medication.[5] Around 80% of all prescribed medications are often dispensed by unqualified personnel, with an average dispensing time of just one minute. Only half of the patients receive instructions on how to take their medicines, and nearly one-third leave the facility without knowing how to use them properly.[6]

In Bangladesh, pharmacies often serve as the first point of contact for patients. Both urban and rural populations frequently turn to pharmacists for medical advice.[7] In developing countries, the practice of using antibiotics without medical prescriptions is well documented, despite regulations prohibiting the sale of antibiotics in this manner.[8]

The sale of antibiotics without prescriptions is a major contributor to rising antibiotic consumption, which facilitates the emergence of antimicrobial resistance.[9] To develop successful treatments intended at limiting inappropriate antibiotic use, an expanded understanding of the procedures and monetary incentives surrounding antibiotic dispensing is required.[10] Given the current state of antibiotic dispensing, this study emphasizes the need for rational selling of antibiotics by retail drug sellers. Its goal is to explore the knowledge and practices of community pharmacists when it comes to selling antibiotics.

Methodology

Study Design and Settings: This cross-sectional study was conducted in the Department of Public Health and Informatic at National Institute of Preventive and Social Medicine (NIPSOM), Dhaka, Bangladesh and was directed to assess the knowledge and practices of retail drug sellers concerning the rational dispensing of antibiotics from January to December 2018. Pharmacies were purposefully selected from the areas of Siddhirganj, Bandar, Fatullah, Narayanganj Sadar sited in the Narayanganj district of Dhaka, Bangladesh.

Sample Selection Criteria: Participants in the study were conveniently selected and included 294 drug sellers. The inclusion criteria specified that participants must be at least 18 years old and have been directly involved in selling medicine for more than one year. Sellers from pharmacies located near hospitals and model pharmacies were excluded from the study.

Data Collection Procedures: Participants in the study were interviewed face-to-face using a pretested, semi-structured questionnaire. This questionnaire included socio-demographic characteristics of the sellers, as well as their knowledge and practices regarding the rational dispensing of antibiotics. The pre-testing was conducted in Pagla Thana of the Narayanganj district in Dhaka, Bangladesh.

Statistical Analysis: Data was entered, curated and analyzed using IBM SPSS Version 23 (New York, USA). Descriptive statistics were expressed as frequency (percentage) and mean (±standard deviation, or SD) for categorical and continuous data, respectively. Chi-square test and Fisher exact test were used to assess the significance of associations between two nominal variables. A p-value of <0.05 at a 95% confidence interval (CI) was considered significant for all statistical tests.

Ethical approval: Participation was voluntary, and confidentiality was ensured, and informed written consent was obtained from all participants. Ethical approval for the study was approved by the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM), Dhaka 1212, Bangladesh (Reference: NIPSOM/IRB/2018/471). All procedures were conducted according to the guidelines of the Declarations of Helsinki.

Results

The table presents the socio-demographic profile of 294 retail drug sellers. The majority of respondents (70.1%) were between 21 and 40 years old, with an average age of 37.4 years and a standard deviation of 7.0 years. Nearly all respondents (99.0%) were male. A significant portion (88.8%) was married, with average marriage duration of 5.2 years and a standard deviation of 1.4 years. A large share, 40.1%, held a bachelor's degree or higher, while 37.4% had a high school education or less. Additionally, 71.1% reported a monthly income of less than 30,000 taka, with the average income being 29,539 taka and a standard deviation of 12,212 taka. Overall, the table indicates that most retail drug sellers in this study were young, male, married, relatively well-educated, but a substantial portion had a low-income level (Table 1).

The following table outlines the professional characteristics of the 294 retail medicine sellers. Nearly half (50.7%) had less than 10 years of experience

in retail drug sales, while 49.8% had been in the business for 10 years or more. The average experience was 9.9 years, with a standard deviation of 5.2 years. Almost all (99.0%) of the sellers had received some form of training in drug dispensing. On average, 53.4% of respondents dispensed to fewer than 60 clients per day, while 46.6% served more than 60 clients.

The average number of clients per day was 69.1, with a standard deviation of 31.0. Additionally, 61.2% of respondents sold fewer than 20 pieces of antibiotics per day, while 38.8% sold more than 20 pieces. The mean daily sales of antibiotics were 24.1 pieces, with a standard deviation of 13.9. A significant majority (78.6%) reported selling fewer than 10 pieces of antibiotics without a prescription each day, while only 6.8% sold over 20 pieces without a prescription. The average number of antibiotics sold without a prescription per day was 5.4, with a standard deviation of 8.8 (Table 2).

This table highlights the knowledge of retail medicine sellers regarding the rational dispensing of antibiotics. A significant majority (96.3%) of respondents acknowledged that antibiotics should only be sold with a prescription, and 94.6% understood that selling outdated or expired antibiotics is harmful to patients. Nearly all (99.0%) were aware of the risks of repeatedly selling antibiotics based on an old prescription. All respondents knew that antibiotics should not be purchased without a prescription and that physicians are responsible for informing patients about the correct dosage and duration of antibiotic use.

Table 1: Socio-demographic Characteristics (n=294)

Characteristics	Frequency	Percent
Age groups		
21 to 40 Years	206	70.1
41 to 60 Years	88	29.9
Mean±SD	37.4±7.0	
Gender		
Male	291	99.0
Female	3	1.0
Marital status		
Married	261	88.8
Unmarried	33	11.2
Mean±SD	5.2±1.4	
Education		
HSC and below	110	37.4
Diploma	66	22.5
Bachelor and above	118	40.1
Monthly incomes		
≤30,000 BDT	209	71.1
>30,000 BDT	85	28.9
Mean±SD	29539±12212	

Table 2: Information related to Professional Attributes (n=294)

Attributes	Frequency	Percent
Duration of retail drug sales		
<10 Years	149	50.7
≥10 Years	145	49.8
Mean±SD	9.9±5.2	
Had drug dispensing training		
Yes	291	99.0
No	3	1.0
Daily number of clients		
≤60	157	53.4
>60	137	46.6
Mean±SD	69.1±31.0	
Antibiotics sold per day (in pieces)		
≤20	180	61.2
>20	114	38.8
Mean±SD	24.1±13.9	
Number of antibiotics sold a day without a prescription (in pieces)		
≤10	231	78.6
11-20	43	14.6
>20	20	6.8
Mean±SD	5.4±8.8	

Additionally, 91.2% recognized the importance of informing patients about potential adverse effects of antibiotics, and all pharmacists knew that selling antibiotics without a prescription should be stopped, advising patients to consult a physician for one. However, only 78.6% were familiar with the term "Antibiotic Resistance." (Table 3)

The table outlines the practices of retail drug sellers regarding the rational dispensing of antibiotics. Only 5.8% of respondents reported consistently checking prescriptions before dispensing antibiotics, though a larger proportion (12.2%) advised consumers not to purchase antibiotics without a prescription. The majority (78.6%) helped consumers understand the correct dosage and duration as indicated on the prescription. Meanwhile, 32.0% informed consumers to consult a doctor if they experienced side effects after taking antibiotics. However, a significant 76.5% of respondents dispensed antibiotics based on old prescriptions. The table reveals that, while many retail drug sellers educate consumers on proper antibiotic use, ideal practices- such as verifying prescriptions and avoiding the sale of antibiotics based on outdated prescriptions were not widely followed. (Table 4)

Table 3: Knowledge on rational dispensing of antibiotics (n=294)

Attributes	Positive Responses	
	Frequency	Percent
Knew that it is mandatory to sell antibiotics with prescription	283	96.3
Knew that selling outdated antibiotics is harmful to patients	278	94.6
Knew that repeatedly selling antibiotics with an old prescription poses risks to patients	291	99.0
Knew that patients should not purchase antibiotics without a prescription	294	100
Knew that patients needed to be informed about the prescribed dosage and duration of antibiotics	294	100
Knew that it's necessary to inform patients about the adverse effects of antibiotics	268	91.2
Knew that pharmacists should stop dispensing antibiotics without a prescription	294	100
Knew that pharmacists have to encourage patients to consult with physicians to get a prescription	294	100
Knew the term "Antibiotic Resistance"	231	78.6

Table 4: Practices on rational dispensing of antibiotics (n=294)

Attributes	Positive Responses	
	Frequency	Percent
Followed the practice of verifying prescriptions before dispensing antibiotics	17	5.8
Advised consumers not to purchase antibiotics without a prescription	36	12.2
Helped consumers in understanding the dosage and duration of antibiotics as indicated on the prescription	231	78.6
Advised consumers to consult a doctor if any side effects occur after taking antibiotics	94	32.0
Dispensing antibiotics based on an old prescription	225	76.5

Table 5: Association of Different Variables with Dispensing Antibiotics Without Prescription (n=294)

Variables	Dispense Antibiotics without Prescription			P-value
	Yes	No	Total	
	n(%)	n(%)	n(%)	
Age Groups				
21 to 40 Years	194(66.0)	12(4.1)	206(70.1)	*0.002
41 to 60 Years	83(28.2)	5(1.7)	88(29.9)	
Education				
HSC & below	87(31.1)	13(6.3)	110(37.4)	0.079
Diploma	46(16.5)	20(6.0)	66(22.5)	
Bachelor & above	30(6.2)	88(33.9)	118(40.1)	
Monthly income				
≤30,000 BDT	198(67.3)	11(3.8)	209(71.1)	0.595
>30,000 BDT	79(26.9)	6(2.0)	85(28.9)	
Duration of retail drug sales				
<10 Years	141(48.0)	8(2.7)	149(50.7)	0.807
≥10 Years	136(46.7)	9(3.1)	145(49.8)	
Daily number of clients				
≤60	148(50.3)	9(3.1)	157(53.4)	*0.002
>60	129(43.9)	8(2.7)	137(46.6)	
Antibiotics sold per day (in pieces)				
≤20	167(56.8)	13(4.4)	180(61.2)	0.419
>20	110(37.4)	4(1.4)	114(38.8)	

†Chi-square test, *Statistically significant value

This table presents the relationship between various demographic, socioeconomic, and business-related factors and the practices of dispensing antibiotics without a prescription among retail drug sellers. The analysis revealed that younger sellers (aged 21-40) were significantly more likely to dispense antibiotics without a prescription compared to older sellers (aged 41-60). No significant associations were found between education, monthly income, years of experience in retail drug sales, or the number of antibiotics sold per day with the practices of dispensing antibiotics without a prescription. However, drug sellers who served a higher daily number of clients were significantly more likely to dispense antibiotics without a prescription than those with fewer clients. (Table 5)

The majority of participants demonstrated a good level of knowledge (94.5%), while a small portion had an average level of knowledge (5.2%). Regarding practices, most participants exhibited an average level (68.3%), with a minor group showing poor practice levels (5.2%). (Figure 1)

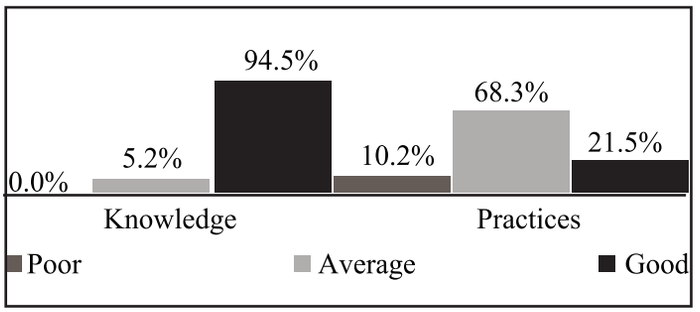

Figure I: Levels of knowledge, and practices on rational dispensing of antibiotics (n=294)

Discussion

In this study, the mean age of the respondents was 37.4±7 years. The largest portion of participants (49.7%) fell within the 31-40 age groups. A study in Ethiopia reported that respondents' ages ranged from 27 to 37 years.10 In Syria, the average age of retail drug sellers was 39.8±10 years,[11] while in Pakistan 55.2% of respondents were aged 20 to 29.[12] Similarly, a study in Saudi Arabia found that 83% of respondents were between 19 and 30 years old.[13] In Myanmar, the majority of medicine sellers were found to be in the 36-45 age group.[14] In this study, 99% of the respondents were male, and 1% was female. A study in Turkey, however, found that 55% of retail drug sellers were female.[15] In contrast; similar to our findings, a study in Saudi Arabia reported that 100% of the respondents were male.[16] Among the respondents, 40.1% had a bachelor's degree or higher, and 22.5% held a diploma. In comparison, a study in Pakistan showed that 83.5% had a bachelor's degree,[12] while in Saudi Arabia, 85.0% of pharmacy sellers held a bachelor's degree.[13] This highlights a discrepancy in educational qualifications between the respondents in this study and those in Pakistan and Saudi Arabia. Regarding professional experience, the average duration of respondents' involvement in retail drug selling was 9.9±5.2 years. Of the respondents, 40.1% had been in the profession for 6-10 years, while 25.2% had 11-15 years of experience. In contrast, a study in Ethiopia reported respondents' experience ranging from 2 to 8 years10, while in Egypt, the average was 5.3 years.[17] In this study, the average number of customers per day was 69.1±31.0, with a mean sale of antibiotics at 24.1±13.9 pieces per day. A study in Saudi Arabia found that more than a quarter (27.9%) of respondents reported dispensing over 300 medications daily, while nearly 90% dispensed fewer than 50 antibiotics each day.[16] The average number of customers purchasing antibiotics without a prescription was 5.4±8.8 per day. Among the respondents, 78.6% reported buying antibiotics without a prescription daily, while 14.6% reported purchasing them occasionally. A study in Vietnam indicated that 50% of urban patients bought antibiotics without a prescription,[18] compared to 77.6% in Saudi Arabia[19] and 64.6% in northern Spain.[20]

In observing practices among the respondents, only 5.8% required a prescription before dispensing antibiotics, while 94.2% did not. In Greece, 85% of retail drug seller's dispensed antibiotics without a prescription,[21] followed by 80% in Albania[22], 97.9% in Saudi Arabia,[13] and 89% in Syria.[23] Additionally, 12.2% of respondents advised consumers against purchasing antibiotics without a prescription, while 87.8% did not provide such warnings. Furthermore, 78.6% of the respondents assisted their customers in understanding the dosage and duration of antibiotics as indicated on the prescription. In comparison, 31.4% of drug sellers in Turkey,[15] 94.5% in Spain,[24] and 77.5% in Egypt offered guidance on the dosage and duration of antibiotics.[17] Among the respondents, 32.0% advised consumers to see a doctor if any side effects occurred after taking antibiotics. In comparison, a study in Turkey reported that 67.1% of retail drug sellers recommended consulting a physician for side effects, while 47.4% in Syria issued warnings about potential side effects.[11]

In Saudi Arabia, however, none informed patients about possible side effects after taking antibiotics.[19]

The majority of participants exhibited a high level of knowledge (94.5%), while a small percentage had a moderate level of knowledge (5.2%). Regarding practices, most participants demonstrated an average level (68.3%), with a minor group showing poor practices (5.2%). A significant statistical association ($p<0.05$) was identified between the age of the medicine sellers and the dispensing of antibiotics without a prescription, with younger sellers being more likely to sell antibiotics without prescriptions. A similar significant association was reported in a study conducted in Pakistan.[25] Additionally, researchers in Eritrea also found a significant correlation between the ages of medication dealers and the sale of antibiotics without prescriptions.[26] Another notable statistical association in this study was between the daily number of clients and the sale of antibiotics without prescriptions; drug sellers with a higher number of daily clients were more likely to dispense antibiotics without a prescription.

Conclusion

According to the study, the majority of retail drug sellers showed average practices, although having good knowledge. If the irrational dispensing of antibiotics is not controlled, it could lead to a public health disaster. Practical, hands-on training programs, including behavior change interventions, should be introduced to educate retail drug sellers about the severity of this issue. A robust referral system should be implemented promptly to provide optimal healthcare, helping to reduce self-medication. Existing laws and regulations on antibiotic use need to be updated, and new strategies should be adopted to curb the indiscriminate sale of antibiotics.

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Original Article

Approach of Drug Treatment on Drug Prescription Pattern for Bronchial Asthma at a Tertiary Level Hospital

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Abstract

Background: A wide variety of medicines are now accessible for asthma treatment and it is important to choose the most favorable treatment. ***Objective:*** The purpose of the present study was to evaluate the Drug prescribing pattern of bronchial asthma in a tertiary level hospital. ***Methodology:*** This cross-sectional type of observational study was carried out over one year in the Department of Pharmacology in collaboration with the Department of Respiratory Medicine and Medicine at Mymensingh Medical College and Hospital, Mymensingh. A total of 160 patients were selected non-randomly for the study. The prescription data from 160 patients with asthma patients were studied using a prescription auditing pro format. Data were recorded from the patients attending the Outpatient Department of Mymensingh Medical College and Hospital. Oral consent was taken from the patients before filling the consent form. ***Results:*** During the study, 160 patients were monitored according to their inclusion and exclusion criteria. Demographic analysis of data revealed that there were 73.75% women and 26.25% men in the study. The study showed that maximum patients with asthma belonged to 28-37 years' age group. Most commonly use single drug is Montelukast that is 6.25% and most commonly used combination therapy is Salmeterol plus Fluticasone, Salbutamol and Montelukast that are 28.13%. Drugs prescribed as monotherapy in this study was Montelukast (6.25%), Methylxanthine (3.13%), Antihistamine (1.88%) and Salbutamol (1.88%). Of these, Montelukast was the preferred drug as monotherapy. ***Conclusion:*** The approach to the treatment of bronchial asthma are vary depend on the severity of the disease.

Keywords: Combination therapy; Monotherapy; Prescription audit; Prescription pattern
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Introduction:

Bronchial asthma is the most common disease among respiratory tract infections that collaborate with or characteristics of bronchial tree inflammation and airflow limitation giving rise to difficulty in respiration and hypoxia.[1] In clinical practice various variants of asthma are found such as extrinsic or intrinsic asthma, allergic or asthmatic bronchitis, and wheezy bronchitis.[2] In the running year the rate of asthma patients increased but in the preceding year, it was downcast.[3] Allergens, cold exposure, spring, smoke, air pollution, and town areas are causative factors for bronchial asthma.[4] In monotherapy or combination therapy, corticosteroids in inhaled form play the main role play in bronchial asthma.[5] In the modern period, environmental factors are the main culprit rather than genetic factors.[6] Regarding this disease every patient and

physician should have study and keep knowledge. So, the approach to the treatment of bronchial asthma either monotherapy or combination therapy, and the boundary of knowledge between patient and doctor is grown by drug prescribing samples for bronchial asthma[7] Worldwide, asthma cases are increasing at a rate of 50 percent every decade, and according to the World Health Organization, by the year 2020, asthma will become the third leading cause of death. Drug utilization research facilitates the rational use of drugs in populations. The prescription of a well-documented drug at an optimal dose, along with appropriate information and at an affordable price altogether counts as the rational use of the drug. It is difficult to start a discussion on rational drug use or to suggest measures to improve prescribing practice without knowledge of how drugs are being prescribed and applied.[8] Following international consensus on asthma management, it is reasonable to hope that community prescribing should align with recognized guidelines to optimize asthma treatment.[9] The purpose of the present study was to evaluate the drug prescribing pattern of bronchial asthma in a tertiary level hospital.

Methodology

Study Settings and Population: This cross-sectional type of observational study was carried out over one year from July 2017 to June 2018 in the Department of Pharmacology in collaboration with the Department of Respiratory Medicine and Department of Medicine at Mymensingh Medical College and Hospital, Mymensingh, Bangladesh. During the study, 160 patients were monitored according to their inclusion and exclusion criteria. The inclusion criteria were patients of either sex, patients of all age groups, and patients with diagnosed bronchial asthma were willing to enrol in the study with informed consent. The exclusion criteria were patients who are suffering from other systemic disorders (Heart diseases, Cancer, Tuberculosis).

Study Procedure: Data was collected from outdoor prescriptions. Data was also collected from the patient by questionnaire. A total of 160 patients were selected non-randomly for the study. The prescription data from 160 patients with asthma patients were studied using a prescription auditing pro forma. Data were recorded from the patients attending the Outpatient Department of Mymensingh Medical College and Hospital. Verbal consent was taken from the patients before filling the pro forma. Data related to type of bronchial asthma, type of drugs used, monotherapy, combination therapy, route of administration, drug schedule and various drug delivery devices. Data related to knowledge of use meter dose inhalers and nebulization.

Statistical Analysis: Findings were recorded and analysed. Collected data were checked and edited first and processed with the help of the software Statistical Package for Social Sciences (SPSS) version 21 and analysed. Statistical analyses were done by using appropriate statistical tools. Data were expressed in means with standard deviations for continuous variables and categorical variables were presented as frequency. Statistical significance was assessed at the 0.05 level for all analyses.

Ethical Clearance: Institutional Review Board (IRB) clearance, Memo no. MMC/IRB/2018/24, Dated 13/01/2018. This is to certify that the thesis protocol entitles "Drug Prescription Pattern for Bronchial Asthma in a Tertiary level Hospital" submitted by Dr. Manira Khanam Nishi as a student of M.Phil (Pharmacology) Part-1 Final has been reviewed and approved by the Institutional Review Board (IRB) of Mymensingh Medical College.

Results

Out of 160 patients, 139 patients were treated with combination therapy (86.88%) and 21 patients were treated with monotherapy (13.13%).

Table 1: Approach of Treatment

Approach of treatment	Frequency	Percent
Monotherapy	21	13.1
Combination therapy	139	86.9
Total	160	100.0

Here we can see the frequency of use of antiasthmatic drugs in single or combination therapy. The most commonly usedsingle drug is Montelukast which is 6.25% and the most commonly used combination therapy is Salmeterol plus Fluticasone, Salbutamol, and Montelukast which is 28.13% (Table 2).

Discussion

The objective of the current study was evaluating the prescription pattern for bronchial asthma at a tertiary care hospital. Beside this, We also aimed to assess the pattern of using drugs in the treatment of asthma, use of drug as mono therapy or combination therapy, knowledge regarding metered dose inhaler and nebulization as well as route of administration, patient's knowledge regarding drug schedule and various drug delivery devices. There were no cases of severe acute asthma encountered in the study.

Table 2: Anti-asthmatic Drugs Prescribed in Bronchial Asthma in Single and Combination Therapy

Name of Drugs	Frequency	Percent
Montelukast	10	6.25
Methylxanthine	5	3.13
Antihistamine	3	1.88
Salbutamol	3	1.88
Beclomethasone, Montelukast	4	2.5
Salmeterol+Fluticasone, Montelukast	25	15.63
Salmeterol+Fluticasone, salbutamol	10	6.25
Salmeterol+Fluticasone, salbutamol, montelukast	45	28.13
Ipratropium bromide + Salbutamol, Methylxanthine, Montelukast	4	2.5
Salmeterol+Fluticasone, Salbutamol, Antihistamine, Montelukast	28	17.5
Salmeterol+Fluticasone, Salbutamol, antihistamine, Methylxanthine, Montelukast	18	11.25
Salmeterol+Fluticasone,Ipratropium bromide+salbutamol, antihistamine, montelukast	5	3.13
Total	**160**	**100**

Asthma is mostly diagnosed from history and clinical examination of the patient by the physician. The goal of this study was to drug prescription patterns for bronchial asthma in tertiary-level hospitals. In addition, we also explore the approach of treatment, which is monotherapy and combination therapy. This prescribing trend or pattern may be attributed to the goals of asthma therapy to minimize chronic symptoms, to prevent recurrent exacerbations, to reduce the need for hospitalization and to maintain near normal pulmonary function.

In this running study, the majority of patients were treated with combination therapy other than monotherapy. The most commonly used single drug is Montelukast which is 6.25% and the most commonly used combination therapy is Salmeterol plus Fluticasone, Salbutamol, and Montelukast which is 28.13% cases.

Out of 160 patients, 139 patients were treated with combination therapy (86.88%), and 21 patients were treated with monotherapy (13.13%). The outcome is similar to Karki et al[8], which state that 92.6% of combination therapy on asthmatic patients and 7.4% patients were tr eated with monotherapy. On the other side by Shimpi et al[10] reported that monotherapy (76%) was higher than combination therapy (24%). The approach of drug treatment in bronchial asthma combination therapy is mostly found other than single therapy. Combination therapy study reported by Rajathilagam et al[11] and Prasad et al[3]. Drugs prescribed as monotherapy in this study was Montelukast (6.25%), Methylxanthine (3.13%), Antihistamine (1.88%) and Salbutamol (1.88%). Of these, Montelukast was the preferred drug as monotherapy, which is contrast to the study conducted by Thamby et al[12]. The limitation of monotherapy is suboptimal efficacy, development of resistance, dose related side effects and limited scope of action. On the other hand, limitation of combination therapy is increased risk of adverse effects, drug interactions, complexity in dosing, cost, lack of evidence, resistance issues and monitoring and adjustment.

Conclusion

The approach to the treatment of Bronchial asthma are vary depend on the severity of the disease. In severe cases of bronchial asthma use combination therapy other than monotherapy.

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Conflict of Interest: There was no conflict of interest to any of the authors.

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Original Article

One-Year Case Study of Autopsy of Hanging in a Tertiary Teaching Hospital at Dhaka City of Bangladesh

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Abstract

Background: Suicidal hanging is not only a problem of any specific country, state or region but also a global problem irrespective of age, sex, race, religion and nationality and so on. ***Objective:*** The objective of the study was to find out the sociolect-demographic profiles of suicidal hanging within a leading urban area in Bangladesh along with the autopsy findings. ***Methodology:*** This was a cross-sectional type of study. It was conducted in the Department of Forensic Medicine at Dhaka Medical College, Dhaka, Bangladesh from January 2022 to December 2022 maintaining legal and ethical issues. Total 120 autopsies were done in order to ascertain deaths for suicidal hanging. Ligature material used by the victim was noted from the available forensic reports. The accompanying police papers provide much of the information regarding age, sex, residence, marital status, date of date, reasons and manner of death, and all other relevant information about the case. ***Results:*** The study findings revealed that female victims (53.3%) were slightly predominant than the males (47.7%). Young ages up to 33 years (66.7%) were the majority of the victims. Muslim population (85.83%) died due to suicidal hanging. Definite reasons for suicides by hanging could not be find out in 6.67% cases. But family disharmony (21.67%) was one of the leading cause of deaths. Parchmentization in subcutaneous tissue (93.33%), Dribbling of saliva (13.33%) and tongue bite (8.33%) were found externally indicating antemortem suicidal hanging. ***Conclusion:*** In conclusion hanging death is the most common methods of suicides in both urban and rural area in Bangladesh and most of them are younger Muslim female.

Key Words: Autopsy; hanging; suicide

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Introduction:

Hanging is one of the ten leading causes of death in the world with more than million deaths annually.[1] Hanging is also termed as self-suspension. It is therefore defined as a form of violent asphyxia as a result of suspension of the body by a ligature round the neck, the constricting force being the weight of the body. The constricting force is either weight of the whole body or the weight of the head alone. Hanging may be complete or partial depending on the position of the body at the time of hanging.[2] In a hanging, from high point of suspension when the body completely suspends above without touching the ground is called complete hanging and while hanging from low point of

suspension sometime some part of the body touches the ground is called incomplete or partial hanging. It may lead to death by any one or varying combination of the injuries to the spinal cord (Judicial hanging) vagal inhibition and mechanical constriction of the structures of the neck and it is ordinarily presumed to the suicidal unless the circumstantial and the other evidence are strong enough to rebut the presumption.[3]

Study shows that in Asia common suicide methods shift with the introduction of technologies and constructions. The biological, psychological, sociocultural economic, and environmental factors are responsible for the causation of hangings all over the world. These factors contribute to the opportunities and limitations of choice of ligature material to be used by the person for committing suicide.[4] Rapid urbanization, industrialization and emerging nuclear family systems are resulting in social upheaval and distress. In the modern era, internet usage is growing exponentially which is not only shaping our lives but altering our brain also. The applications of Wikipedia, blog, or social networking are being used extensively and the web postings have become the interactive and self-initiated medium to acquire information about changing suicide trends in relation to methods used.

In Bangladesh shari, orna, dopatta, lungi, nylon rope, belt, muffler, ropes are commonly available at home which can be used to hang themselves at any place and any time and table, stool, chair and cot are commonly used to reach the site of suspension.[5] There are unique patterns of suicide methods in Bangladesh that markedly differ from those of the West.[5] This may be due to cross-cultural differences.[6] In Western countries, dog chain, belt, electric cable, scarf, tie, dressing gown cord, shoe lace are used as ligature materials, which are not usually used in our country.[7] The objective of the study was to find out the socio-demographic causes of suicidal hanging within a leading urban area in Bangladesh along with the postmortem findings in order to address the issue with an aim to stop the incidence of suicidal hanging.

Methodology

Study Settings and Population: This was a cross-sectional descriptive type of study, conducted in the Department of Forensic Medicine and Toxicology at Dhaka Medical College, Dhaka, Bangladesh from January 2022 to December 2022 maintaining legal and ethical issues. Total 120 autopsies were done in order to ascertain deaths from suicidal hanging. Excluding judicial hanging execution, this study is done only upon suicidal hanging cases. All other suicidal cases like poisoning, burning are excluded in this study.

Study Procedure: This study was conducted by direct observing the autopsy of Dhaka Medical College, Dhaka from January 2022 to December 2022. Data was collected from there in a tabulated form and study was done. All the demographic variables like age, gender, religion and occupation were recorded. Probable reason for suicide like failure of love affair, family disharmony, prolong illness, domestic violence, extramarital affair, depression, failure in exam, emotional conflict with parents, drug addict, financial problem, online gamble and not ascertained information were collected. Post-mortem reports were also collected to get the findings.

Statistical Analysis: Frequency tabulation was done by Excel method.

Ethical Clearance: Ethical clearance was given from Head of the Department of Forensic Medicine and Toxicology of Dhaka Medical College, Dhaka.

Results

Total 120 suicidal cases of hanging were analyzed during one year period from January 2022 to December 2022. Comparing with the sex of the victims, data revealed that female victims (53.33%) were higher than the males (46.67%) (Table 1). Highest percentage of deaths belongs to two age groups those were 10-21 years (36.67%) and 22-33 (30%) years, a sum of 66.67%(Table 1). Of them 85.83% were Muslims followed by 9.17% Hindu (Table 1). Employed (29.17%) people were more prone to suicidal hanging (Table 1). Though reasons for suicide could not be ascertained in 6.67% but family disharmony (21.67%) were one of the leading causes of death (Table 2). During postmortem examinations, parchmentization was found in 93.3% cases. (Table 3).

Though among the victims, reasons of suicides could not be ascertained in about 6.67% cases. But family disharmony (21.67%) was the leading cause of deaths. Besides that, emotional conflict with parents (18.33%), domestic violence (15%), financial problem (10%), depression (8.33%) were also the significant causes of deaths by suicidal hanging (Table 2).

Dribbling of saliva (13.33%) and tongue bite (8.33%) were found externally indicating antemortem suicidal hanging. Parchmentization in subcutaneous tissues (93.33%) were found in majority cases. Neither hyoid bone nor thyroid cartilage were found fractured (Table 3).

Table 1: Distribution of Hanging According to Sex, age, religion, and by profession(n=120)

Studied variables	Frequency	Percent
Gender		
Male	56	46.7
Female	64	53.3
Total	120	100
Age Group		
10 to 21 Years	44	36.7
22 to 33 Years	36	30.0
34 to 45 Years	27	22.5
46 to 57 Years	9	7.5
58 & above	4	3.3
Total	120	100
Religion		
Muslim	103	85.8
Hindu	11	09.2
Christian	02	01.7
Buddhist	04	03.3
Total	120	100
Profession		
Student	26	21.7
House wife	28	23.3
Unemployed	31	25.8
Employed	35	29.2
Total	120	100

Table 2: Reason for suicide (n=120)

Probable reason for suicide	Frequency	Percent
Failure of love affair	4	3.3
Family disharmony	26	21.7
Prolong illness	2	1.7
Domestic violence	18	15.0
Extramarital affair	6	5.0
Depression	10	8.3
Failure in exam	4	3.3
Emotional conflict with parents	22	18.3
Drug addict	4	3.3
Financial problem	12	10.0
Online gamble	4	3.3
Not ascertained	8	6.7

Table 3: Postmortem report findings

PM findings	Frequency	Percent
Parchmentization	112	93.3
Dribbling of saliva	16	13.3
Tongue bite	10	8.3
Hyoid bone fracture	Nil	Nil
Thyroid cartilage fracture	Nil	Nil

Discussion

Suicide is a major public health problem in Bangladesh. Age, place of residence, economic status and literacy were the major associating factors related to suicide. Adolescents, elderly and those residing in rural regions were the most vulnerable groups.[7] In order to quantify the burden and risk factors of fatal and nonfatal suicidal behaviors in rural Bangladesh a census was carried out in seven sub-districts encompassing 1.16 million people. Face-to-face interviews were conducted at the household level. Findings of the study for common methods for fatal and non-fatal suicidal behaviors were hanging and poisoning.[8] In a study conducted in European Alliance Against Depression (EAAD) countries among seven predominant suicide methods hanging ranked first among females in eight countries and only in Switzerland hanging was second for males.[9] In this present study, it was found that female victims (53.33%) were higher than the males (46.67%) with highest percentage of deaths belongs to two age groups those are 10-21 years (36.67%) and 22-33(30%) years, a sum of 66.67%. That means teenage and young were the dominant ages regarding suicidal hanging. Similar findings regarding sex and age were found in the study conducted in Bangladesh[10] and Iraq.[11] But findings regarding sexual variations were not similar to the study of Kingdom of Saudi Arabia[12] and another study done in Bangladesh.[13] In these studies males outnumbered females. Moreover, fourth decade and above were more prone to suicidal hanging as stated in the study of Saudi Arabia[13] and Bangladesh.[14] In our findings, 85.83% were Muslims followed by a sum of 14.17 % Hindu, Christians and Buddhist which were near similar to the studies in Bangladesh.[10,14] In Bangladesh, the finding of higher percentage of suicidal hanging among Muslim was due to the Muslim majority. Our study showed that employed (29.17%) people were more prone to suicidal hanging followed by unemployed (25.83%). A good percentage of students (21.67%) were also the victims of suicidal hanging. These three comprises of total 76.67% and rest of 23.33% were only housewives. In a study revealed that housewives (35%) and other professions (65%) were the victims of suicidal hanging, though the other professions were not mentioned separately in this study in Bangladesh[11]. Reasons for suicide could not be ascertained in 6.67%but family disharmony (21.67%) were second leading cause of death found in our study. On the other hand, study marked domestic/family related issues comprising 31.06%, 44% and 38.9% respectively.[15,11,14]

Study also revealed that,18.56% and 8% were due to

relationship crisis.[15,11] In our study we found that 3.33% deaths were due to failure of love affairs. While the link between suicide and mental disorders (in particular, depression and alcohol use disorders) is well established, many suicides happen impulsively in moments of crisis. Further risk factors include experience of loss, loneliness, discrimination, a relationship break-up, financial problems, chronic pain and illness, violence, abuse, and conflict or other humanitarian emergencies. The strongest risk factor for suicide is a previous suicide attempt.[16] In this present study during postmortem examinations we found dribbling of saliva (13.33%) followed by tongue bite (8.33%). Dribbling of saliva 29.49% and 39.6% were found in the studies in Bangladesh10 and in Nepal[17] respectively. In this study parchmentization was found in 93.3% cases which was 87.5% in this study of Bangladesh.[10] The study in Nepal showed 35.4% face congestion and cyanosis with hyoid bone and thyroid cartilage fractured in 15.2% and 2.0% respectively.[17] A study in Bangladesh found 5.0% hyoid bone fractured.[18] In this study we did not find any fracture both in hyoid and thyroid cartilage. May be fracture in hyoid and thyroid cartilage were not found in our study due to lack of good number of cases along with old age victims.

The study was conducted in the Dhaka Medical College morgue which is located in the capital city of Bangladesh. As a result, it may not give a similar socio-demographic findings of suicidal hanging in rural area of Bangladesh. Moreover, sample size in this study, though collected within the period of one year was relatively smaller in numbers.

Conclusion

Our study along with other studies of suicidal hanging showed that causes of suicidal hanging and along other findings may differ due to socio-cultural and demographic variations. We have been outlin ed these fact and findings in our study comparing with local, regional and international levels. Moreover, autopsy findings may also differ depending upon various factors related with the suicidal hanging. Our findings may be considered as the tip of the iceberg of a pathetic social problem existing in our society. To reduce the mortality rate of suicidal hanging strategy should be taken and implemented by huge community participation.

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Conflict of Interest: All the authors declared no competing interest.

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Original Article

A Qualitative Study on Drug Abuse Among University and Medical College Students regarding Motivations and First Encounters

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Abstract

Background: The transition to higher education brings stress, social pressures, and potential for drug use as a coping mechanism. University environments can normalize drug use, while medical students face additional pressures due to their curriculum and potential for self-medication. This qualitative study explores motivations and first encounters with drugs among university and medical college students to understand how these factors contribute to drug abuse in this population. ***Objective:*** This study employed qualitative methods to investigate the motivations and experiences that lead to initial drug use among university and medical college students. The aim is to understand how social environments, academic pressures, and potential self-medication practices among the students influence these behaviors. ***Methodology:*** This qualitative study was conducted in the Department of Forensic Medicine & Toxicology, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh from January 2024 and July, 2024 for a period of six months which was employed thematic analysis to explore the motivations and experiences of university and medical college students in Shahbag, Dhaka, Bangladesh, who initiated drug use. Ten participants were recruited through purposive sampling, focusing on students who self-reported current drug use. Data were collected between January and July 2024. ***Results:*** Thematic analysis revealed students using drugs to cope with academic pressure and stress. Social circles normalized drug use, and students sought perceived benefits like focus improvement. First encounters varied, but peer pressure and curiosity played a role. Importantly, students acknowledged negative consequences. This study offers insights into drug abuse motivations among university and medical students. ***Conclusion:*** The study informs targeted prevention programs for universities and medical colleges. These programs should prioritize stress management, mental health support, and debunking drug-related myths to prevent initial use and reduce abuse.

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Introduction:

The World Health Organization reports that drug abuse is a significant global public health concern, with far-reaching consequences for individuals, families, communities, and healthcare systems.[1] Universities and medical colleges, often seen as bastions of academic achievement, are not immune to this pervasive problem. Students within these institutions,

despite their potential and perceived advantages, find themselves susceptible to the allure of illicit substances.[2-5] Understanding the motivations that propel them towards drug use and their experiences during those initial encounters is paramount for developing effective prevention and intervention strategies.

This qualitative study delves into the lived experiences of university and medical college students, aiming to unravel the complex tapestry of factors that contribute to drug abuse within this high-achieving population. We move beyond the sterile world of statistics and charts, seeking instead to capture the voices and stories of individuals who have grappled with the decision to use drugs. While research on drug abuse among university students is extensive, highlighting factors like peer pressure, academic stress, and a desire to experiment, the specific pressures faced by medical college students necessitate a deeper exploration.[6,7] Their demanding curriculum, coupled with the emotional intensity of their chosen field, may create unique vulnerabilities that warrant further investigation. The transition to higher education, a period marked by increased independence, academic pressure, and the need to establish new social networks, can be particularly stressful. These stressors can create fertile ground for unhealthy coping mechanisms, including drug abuse. The social environment within universities plays a significant role as well. Peer pressure, the desire to fit in, and the normalization of drug use among certain social circles can act as powerful motivators for experimentation. The perception of drugs as a tool for enhancing social interaction, alleviating stress, or even improving academic performance (a particularly concerning trend among medical students) further complicates the issue.[8-10]

Medical college students, however, face an additional layer of complexity. Their notoriously demanding curriculum requires them to dedicate long hours to mastering advanced medical knowledge and skills. This intense academic environment can lead to significant levels of stress, anxiety, and even burnout. Witnessing human suffering on a regular basis during clinical rotations further exacerbates these challenges.[4,5,10] Beyond the shared pressures with their university counterparts, medical college students contend with a unique environment that can increase their vulnerability to drug abuse. Their studies delve into the pharmacological effects of various substances, potentially leading to a sense of control or a false perception of safety regarding drug use. The "normalization" of drug use, combined with the high prevalence of mental health issues such as depression and anxiety among medical students, creates a dangerous intersection where self-medication becomes a seemingly viable option.[11-13] The initial encounter with a drug can be a pivotal moment, shaping future patterns of use. Positive or neutral experiences can pave the way for continued exploration, while negative consequences may act as a deterrent. Understanding the context and motivations surrounding these first encounters can provide valuable insights into the decision-making processes of students who initiate drug use. Through qualitative research, we can explore the narratives of students, capturing the emotional state, social context, and perceived benefits that led them to try drugs for the first time. This study aims to shed light on the motivations that propel university and medical college students towards drug use and their experiences during those initial encounters. By delving into the lived experiences of these students, the research seeks to identify the personal and social factors that contribute to the decision to use drugs among university and medical college students, to examine the context surrounding the first encounter with drugs, including the motivations, settings, and perceived benefits or consequences and to compare and contrast the experiences of university and medical college students, identifying any unique pressures or vulnerabilities specific to the medical student population.

This research contributes to the field of drug abuse research by offering a nuanced understanding of the factors that contribute to drug use among this high-achieving population. It delves beyond the statistics to capture the human stories, the complex interplay of pressures, and the motivations that lead students to make choices with potentially devastating consequences. By understanding these factors and the context surrounding first encounters with drugs, we can develop more targeted prevention and intervention strategies specifically tailored to the needs of university and medical college students.

Methodology

Study Settings and Population: This qualitative study was conducted in the Department of Forensic Medicine & Toxicology, Shaheed Monsur Ali Medical College, Dhaka, Bangladesh from January 2024 and July, 2024 for a period of six months. In this qualitative study samples were collected in Shahbag, Dhaka, Bangladesh between January 2024 and July, 2024, employed a thematic analysis approach to delve into the motivations and experiences surrounding first encounters with drug abuse among

university and medical college students. To gain a nuanced understanding of this phenomenon, the research adopted a purposive sampling strategy. Participants were recruited from universities and medical colleges within Dhaka city, specifically targeting students who self-reported current drug use. Inclusion criteria encompassed students enrolled in an undergraduate or postgraduate program at a recognized university or medical college and the willingness to openly discuss their experiences with drug use. This resulted in a total of 10 participants, with 6 students from universities and 4 from medical colleges.

Study Procedure: In-depth interviews were chosen as the primary data collection method. This approach allowed for a deeper exploration of individual experiences and motivations, providing rich and detailed narratives. A semi-structured interview guide was developed to ensure consistency while allowing flexibility to pursue emerging themes during the interviews. The guide explored key areas such as participants' experiences with drug use, including the types of drugs used, frequency of use, and reasons for initiating use, the social and academic pressures faced by students, both within the university/medical college environment and in their personal lives, the context surrounding the first encounter with drugs, including the setting, motivations, and perceived benefits or consequences, the impact of drug use on participants' academic performance, social life, and mental well-being.

Thematic Analysis: Thematic analysis was employed to identify recurring patterns and themes within the interview data. Interviews were audio-recorded and transcribed verbatim to preserve the richness of participants' narratives. A rigorous coding process was then undertaken. Initial coding involved assigning codes that captured the essence of each data segment. As the analysis progressed, these codes were reviewed, refined, and grouped into broader thematic categories that reflected the core concepts and experiences expressed by participants.

To enhance the trustworthiness of the research, member checking was employed. This involved sharing a summary of the preliminary findings and inviting participants to provide feedback on the accuracy and completeness of their representation. Additionally, a detailed audit trail was maintained throughout the research process, documenting all methodological decisions, data collection procedures, and analysis steps. By employing in-depth interviews and thematic analysis, this research aimed to capture the lived experiences of university and medical college students struggling with drug abuse. The focus on first encounters provides a critical window into the decision-making processes and contextual factors that contribute to drug use within this high-achieving population.

Ethical Clearance: All participants provided written informed consent after receiving a detailed explanation of the study's objectives, data collection procedures, and confidentiality measures. To ensure participant anonymity, all identifying information was removed from interview transcripts and replaced with pseudonyms.

Results

This section delves into the key findings of the qualitative study exploring motivations and first encounters with drug abuse among university and medical college students. Thematic analysis of the in-depth interviews revealed several recurring themes that shed light on the complex factors that contribute to drug use within this population.

1. Academic Pressures and Stress

Both university and medical college students emphasized the significant academic pressures they faced. The demands of coursework, deadlines, and the pressure to excel created a constant sense of stress and anxiety. One university student, Sameer (pseudonym), described feeling overwhelmed by academic expectations: "There's this constant pressure to get good grades, to be involved in extracurricular activities, and to land a great internship. It's like you're always on edge, and sometimes drugs just seem like a way to escape for a while."

Medical college students echoed these sentiments, but their experiences were further compounded by the emotional intensity of their chosen field. Witnessing human suffering and the long hours dedicated to clinical rotations added another layer of stress. A medical student, Rasel (pseudonym), shared: "Seeing so much pain and illness takes a toll on you. The pressure to perform flawlessly during rotations is immense. Sometimes, drugs seem like the only way to numb the emotional burden."

2. Social Pressures and Experimentation

The social environment emerged as another significant factor influencing students' decisions regarding drug use. Peer pressure, the desire to fit in, and the normalization of drug use within certain social circles were frequently mentioned by participants. Several students described experimenting with drugs at social gatherings or parties, often influenced by their peers. A university student, Marjan (pseudonym), stated: "There's a real party culture here, and drugs are just part of it. At first, I tried it because everyone else was doing it, and I didn't want to feel left out."

3. Perceived Benefits of Drug Use

Many participants, particularly university students, described using drugs as a coping mechanism to manage stress, anxiety, or social awkwardness. Some students also mentioned using drugs to enhance focus or improve academic performance, a trend more prevalent among medical college students. A medical student, Emily (pseudonym), explained: "The workload in medical school is insane. Sometimes, I felt like I couldn't keep up without using yaba to help me concentrate for longer periods."

4. First Encounters and Motivations

The first encounter with drugs often emerged as a pivotal moment for participants. Positive or neutral experiences with drugs sometimes led to continued exploration, while negative consequences could act as a deterrent. Several students described initiating drug use in social settings, influenced by peers or seeking a sense of belonging. Others mentioned experimenting with drugs out of curiosity or a desire to alleviate stress or anxiety.

5. Differences Between University and Medical College Students

While the core themes of academic pressure, social influences, and perceived benefits of drug use emerged for both university and medical college students, some distinctions were evident. Medical college students placed greater emphasis on the emotional toll of their studies and the "normalization" of prescription drugs within the medical field. They also more frequently described using drugs as a coping mechanism for dealing with the emotional intensity of their chosen profession.

6. Negative Consequences

Despite the perceived benefits some participants initially attributed to drug use, the interviews also revealed a range of negative consequences. These included declining academic performance, strained relationships, and mental health issues such as anxiety and depression. Several participants described feeling trapped in a cycle of drug use and struggling to manage their studies and social lives effectively.

These findings paint a complex picture of the factors that contribute to drug abuse among university and medical college students. The constant pressure to excel, the emotional toll of their chosen fields, and the social environment all play a significant role. Furthermore, the initial motivations and experiences surrounding first encounters with drugs can shape future patterns of use.

Discussion

The findings illuminate the complex web of factors that propel university and medical college students towards drug abuse.

The constant pressure to excel academically, a theme resonating with prior research by stress and drug use among students, creates fertile ground for unhealthy coping mechanisms.[2] This aligns with another study conducted in the United States of America that identified a positive correlation between academic stress and the misuse of prescription stimulants.[9] Medical students, burdened by these shared pressures, grapple with the additional emotional intensity of their field. Witnessing human suffering and the long hours dedicated to clinical rotations, as mentioned by participants, add a unique layer of stress, potentially explaining why they more frequently describe emotional burden as a motivator for drug use. This aligns with research done in Lebanon among medical students which highlights the increased prevalence of depression and anxiety among medical students, conditions that can lead to self-medication attempts with drugs.[4]

The social environment emerged as another significant player, influencing students' decisions regarding drug use. Our findings echo research by Ojiaku and Nwokoro on peer pressure and drug use, demonstrating the influence of peer pressure and the normalization of drug use within certain social circles. Students described experimenting with drugs at social gatherings or parties, often influenced by their peers.[14] This underscores the importance of fostering healthy social environments within universities and medical colleges that discourage drug use.

The concerning trend of students perceiving drugs as a tool for enhancing focus or academic performance, more prevalent among medical college students, warrants further investigation. Similar studies on this matter, highlights the potential for dependence and negative health consequences associated with the non-medical use of prescription stimulants.[6,10]

The first encounter with drugs often emerged as a pivotal moment for participants, aligning with a review article on of psychosocial factors linked to adolescent substance use, which emphasizes the importance of understanding the context and motivations surrounding initial drug use. Positive or neutral experiences, as described by some participants, could lead to continued exploration, while negative consequences could act as a deterrent. These findings highlight the need for intervention strategies that target both preventing initial drug use and mitigating the

risks associated with continued use.[15,16] While core themes emerged for both university and medical college students, some distinctions were evident. Medical college students placed greater emphasis on the emotional toll of their studies and the "normalization" of prescription drugs within the medical field. This aligns with research titled “Substance Use Among Physicians and Medical Students” which highlights the specific pressures faced by medical students and their increased vulnerability to drug abuse.[17]

This study is not without limitations. The qualitative approach provides rich data but may not be generalizable to the entire population. Additionally, self-reported data can be subject to bias. Future research could benefit from employing a mixed-methods approach to gain a more comprehensive understanding. Further exploration is needed on the long-term consequences of drug use on academic performance, mental health, and career trajectories of these students.

Conclusion

The study offers valuable insights for developing multi-pronged prevention and intervention strategies. These strategies should address the academic pressures, social influences, and emotional stressors specific to university and medical college students. Universities and medical colleges have a crucial role to play in fostering healthy campus environments, promoting stress management techniques, and providing accessible mental health resources. Additionally, educational programs aimed at deconstructing the myths surrounding the perceived benefits of drug use are essential for preventing initial drug use and mitigating the risks associated with continued abuse.

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Original Article

Short-term Impacts of Secondary Postpartum Haemorrhage on Maternal Health

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Abstract

Background:Postpartum haemorrhage (PPH) is unpredictable and potentially catastrophic, occurring even in women considered being at low risk. PPH endures as a significant cause of maternal morbidity and mortality in low- and middle-income countries (LMICs). ***Objective:*** The purpose of the present study was to observe the short-term effects of secondary postpartum hemorrhage on maternal health. ***Methodology:*** This hospital-based cross-sectional study was conducted involving 40 purposively selected women aged 18 years and older who were diagnosed with secondary PPH and admitted more than 24 hours after childbirth or during the puerperal period. These women were interviewed using a pre-tested semi-structured questionnaire in the purposively selected Department of Obstetrics and Gynecology at Sylhet MAG Osmani Medical College Hospital in Bangladesh. ***Results:*** Secondary PPH was significantly more common in the 26–35 age group (67.5%) compared to those aged 25 years or younger (32.5%). Among the women studied, 22.5% were primipara and 77.5% were multiparas, with secondary PPH occurring significantly more frequently in multipara women. A notable proportion of patients (70%) presented with varying degrees of anemia. Retained placental fragments were identified as the primary cause of secondary PPH in 52.5% of cases, followed by endometritis and sub-involution, each accounting for 15%. More than half of the patients (57.5%) required blood transfusions based on the severity of their anemia, and 30% of those with secondary PPH had hospital stays that exceeded 5 days. ***Conclusion:*** Despite extensive collaborative efforts at all levels, implementation and adherence to recommended management practices for postpartum hemorrhage in obstetric emergencies remain insufficient.

Key Words: : Secondary postpartum haemorrhage, short-term impacts, maternal health, Bangladesh.
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Introduction:

Postpartum hemorrhage (PPH) is defined as bleeding from or into the genital tract following childbirth, lasting up to the end of the puerperium, that adversely impacts the patient's condition, as indicated by an increased pulse rate and decreased blood pressure.[1] It is an obstetric emergency that affects 1.0 to 10.0% of all deliveries and caused over

80,000 maternal deaths around the world in 2015.[2] The prevalence of PPH varies by region, with the highest rates reported in Africa (5.1–25.7%), followed by North America (4.3–13%) and Asia (1.9–8%).[3,4] Incidence has also been rising, increasing in Canada from 5.1-6.2% between 2003 and 2010,[5] and in the USA from 2.9-3.2% between 2010 and 2014.[6] Postpartum haemorrhage varies in intensity and duration. It may be sporadic and gradually decreases over several weeks.[7] Approximately 25% of women report vaginal bleeding that persists for over 6 weeks.[8] Visual estimation of blood loss is often inaccurate; therefore, clinical signs and symptoms should also be considered in the assessment of PPH.[9] Secondary postpartum haemorrhage is a severe vaginal bleeding or profuse lochial discharge occurring at least 24 hours after the end of the 3rd stage of labour and within 6 weeks of delivery.[10] It occurs at a rate of 1-2%, with the majority of instances occurring between 8-14 days after birth.[11] It can cause deadly side effects such as anaemia, shock, sepsis, disseminated intravascular coagulation (DIC), hepatic and renal failure, respiratory distress syndrome, and Sheehan's syndrome.[12] Numerous studies had documented the effectiveness and immediate maternal complications associated with pelvic arterial embolization,[13] uterine and hypogastric artery ligation,[14-16] and uterine compression sutures[17] for managing PPH, as well as the effects of these procedures on fertility and obstetric outcomes.[18] Delays in diagnosis and appropriate treatment have been noted in many cases of maternal death related to PPH.[19] Therefore, rapid identification and localization of the bleeding site are essential for effective hemostatic management of patients with PPH.[12]

Methodology

Study Design and Population: This was a hospital-based cross-sectional study was carried out to observe the short-term impacts of secondary postpartum haemorrhage on maternal health in the Department of Obstetrics and Gynaecology of Sylhet MAG Osmani Medical College Hospital (SOMCH), Sylhet 3100, Bangladesh. The study comprised 40 patients aged ≥18 years, diagnosed with secondary PPH and admitted after 24 hours of childbirth or during puerperial period prior to interview. Patients having a history of bleeding disorders (Haemophilia and Thrombocytopenia), abnormal per-vaginal bleeding due to systemic conditions (Hypothyroidism, Liver cirrhosis, and Chronic renal failure), and those taking anticoagulants were excluded from the study.

Study Procedures: From January 2018 to December 2019, a pretested semi-structured questionnaire was used to conduct in-person interviews with study participants at their convenience. Upon admission, a comprehensive history was obtained from the patient, followed by a clinical examination.

Statistical Analysis: Data were entered, coded, and analyzed using IBM SPSS Version 25 (New York, USA). Descriptive statistics are presented as frequencies (percentages) for categorical data and means (±standard deviation, SD) for continuous data. Z test was employed to evaluate the significance of comparisons. A p-value of less than 0.05 at a 95% confidence interval (CI) was deemed statistically significant for all tests conducted.

Ethical Approval: The interviewer obtained informed consent and permission to record the interviews from participants before commencing the interviews. Participation was voluntary, and participants were informed that they have the right to withdraw at any point without any negative consequences. The participants' confidentiality was maintained throughout the study. Ethical approval was obtained from the 'Research Ethical Committee' of Sylhet MAG Osmani Medical College, Sylhet 3100, Bangladesh. All procedures were conducted according to the guidelines of the Declarations of Helsinki.

Results

The mean age of the patients was 27.6±4.7 years. The majority (42.5%) were in the 26-30 age groups, while 25.0% fell within the 31-35 age groups. Secondary PPH occurred significantly more often in the 26-35 age group (67.5%) compared to those aged ≤25 years (32.5%). Half of the patients (50.0%) had a primary level of education, and 37.5% were illiterate. Most of the patients were homemakers (92.5%). (Table 1)

Among the women studied, 22.5% were primipara, while 77.5% were multipara. Secondary PPH was significantly more prevalent in multipara compared to primipara. Over two-thirds of the women (77.5%) received antenatal care. The delivery took place in a hospital for 32.5% of the patients, while 67.5% delivered at home, indicating a significantly higher rate of home deliveries compared to hospital deliveries. Vaginal delivery was the mode for 75.0% of the patients, whereas 25.0% underwent a cesarean section, with vaginal deliveries occurring significantly more often than cesarean deliveries. (Table 2)

Figure I illuminates that complications during the last pregnancy were reported by 20.0% of patients, while

complications during the last delivery were reported by 65.0%. Figure II illustrates that the most common complications during pregnancy were premature rupture of membranes (PROM) at 50.0% and antepartum hemorrhage (APH) at 25.0%. Figure III indicates that the most prevalent complications during delivery were prolonged labor at 30.8% and retained placenta at 26.9%.

All patients presented with per vaginal bleeding. Additionally, 12.5% reported foul-smelling vaginal discharge, 25% experienced fever, 12.5% were in shock, and 12.5% had generalized weakness. Most cases of secondary postpartum hemorrhage (PPH) presented between 8–14 days postpartum (40%) and 15–21 days postpartum (22.5%). A significant proportion of secondary PPH patients (70%) exhibited varying degrees of anemia. Retained placental fragments were identified as the primary cause of secondary PPH (52.5%), followed by endometritis and sub-involution (each at 15%). Treatments included dilatation and curettage (42.5%), peripartum hysterectomy (10%), tear repair (10%), conservative management (20%), balloon tamponade (7.5%), uterine exploration (7.5%), and ICU referral (5%). Over half of the patients (57.5%) required blood transfusions based on anemia severity. Hospital stays exceeded 5 days for 30% of secondary PPH cases. (Table 3)

Table 1: Patient's profile (n=40)

Variables	Frequency	Percent	P Value
Age Group			
18 to 20 Years	5	12.5	
21 to 25 Years	8	20.0	0.001
26 to 30 Years	17	42.5	
31 to 35 Years	10	25.0	
Mean±SD	27.6±4.7		
Education			
Illiterate	15	37.5	
Primary	20	50.0	
Secondary	5	12.5	
Occupation			
Homemakers	37	92.5	
Service holders	2	5.0	
• Businesswoman	1	2.5	

Z-test done; p<0.05 considered as statistically significant value

Table 2: Obstetric profile of the patients (n=40)

Variables	Frequency	Percent	P value
Parity			
Primigravida	9	22.5	0.001
Multigravida	31	77.5	
Utilization antenatal care services			
Yes	31	77.5	
No	9	22.5	
Place of Last Delivery			
Home settings	27	67.5	0.001
Hospital settings	13	32.5	
Mode of Last Delivery			
Vaginal	30	75.0	0.001
Caesarean section	10	25.0	

Z-test done; p<0.05 considered as statistically significant value

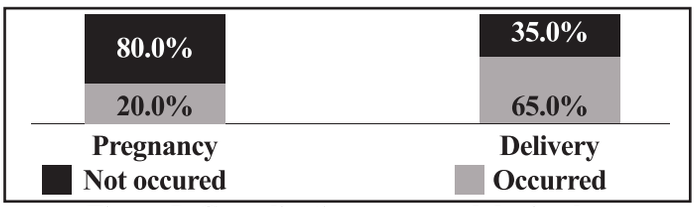

Figure I: Complications occurred during last pregnancy and delivery (n=40)

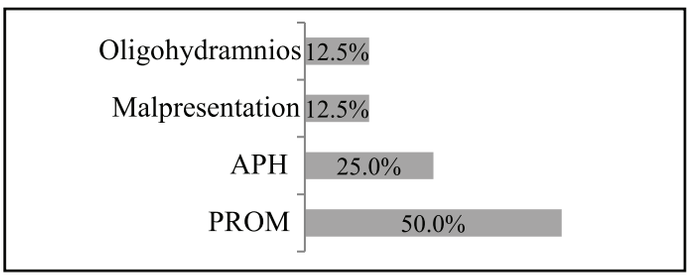

Figure II: Types of complication during last pregnancy (n=8)

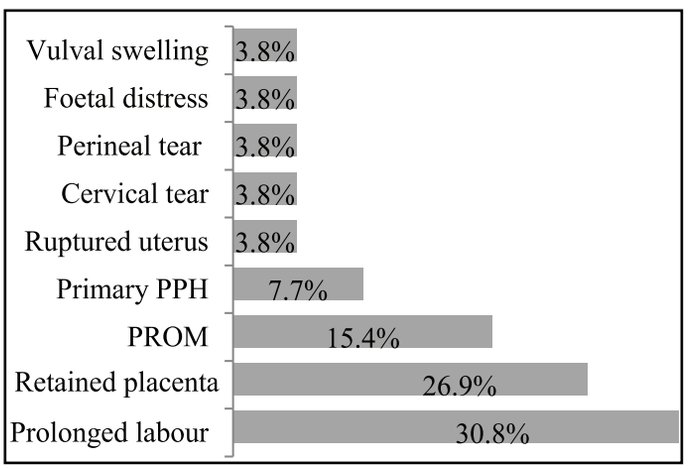

Figure III: Types of complication during last delivery (n=26)

Table 3: Short-term impacts of secondary PPH (n=40)

Variables	Frequency	Percent
Patient's Clinical		
Per-vaginal bleeding presentation	40	100.0
Fever	10	25.0
Foul smelling vaginal discharge	5	12.5
Shock	5	12.5
Generalized weakness	5	12.5
*Multiple responses		
Patient's presentation of PPH at hospital		
≤7 Days	7	17.5
8 to 14 Days	16	40.0
15 to 21 Days	9	22.5
22 to 28 Days	5	12.5
29 to 35 Days	2	5.0
36 to 42 Days	1	2.5
Presence of Anaemia		
Yes	28	70
No	12	30.0
Causes of secondary PPH		
Retained bits of placenta	21	52.5
Endometritis	6	15.0
Sub-involution	6	15.0
Genital tract injury	5	12.5
DIC	2	5.0
Caesarean scar dehiscence	1	2.5
*Multiple responses		
Management modalities		
Dilatation and curettage	17	42.5
Conservative	8	20.0
Peripartum hysterectomy	4	10.0
Repair of tear	4	10.0
Balloon tamponade	3	7.5
Exploration of uterus	3	7.5
Referred to ICU	2	5.0
*Multiple responses		
Patients needed blood transfusion		
Yes	23	57.5
No	17	42.5
Span of hospital stay (in days)		
≤5	28	70.0
>5	12	30.0
Mean±SD	4.9±2.9	

Discussion

In Bangladesh, nearly a fourth of the population lives below the poverty line and households' out-of-pocket expenses account for more than two-thirds of the overall healthcare expenditures. As a result, maternal health remains a critical social, health, and economic priority for the country.[20]

In this study, patient ages ranged from 18 to 35 years, with a mean age of 27.6±4.7 years. This finding aligns with results from the study in Manipur, India where patients mean age was 27±6.0 years with secondary PPH.[21] Similarly; another study reported an age range of 18 to 38 years, with a mean age of 25±4.8 years.[22] Secondary PPH was significantly more common among patients aged 26 to 35 years (67.5%) compared to those aged 25 years or younger (32.5%). The majority of secondary PPH cases occurred in the 30–40 age group (46.7%), followed by the 20–29 age group (35.5%) also observed in the study.[23]

In the study, 22.5% of women were primipara, while 77.5% were multipara, with secondary postpartum hemorrhage (PPH) occurring significantly more often in multipara women; and this finding aligns with the study where 76% of cases in multipara and 24% in primipara.[24] Similarly, in another study also found 42.4% primipara and 57.6% multipara in their secondary PPH cases,[22] while a higher prevalence of secondary PPH among multipara (62.2%) compared to primipara (37.8%) was observed.[23]

The delivery took place in a hospital for 32.5% of the patients, while 67.5% delivered at home, indicating a significantly higher rate of home deliveries compared to hospital deliveries. 72% of patients with secondary PPH were referrals, initially managed outside the hospital before presentation.[24] Vaginal delivery was the mode for 75.0% of the patients, whereas 25.0% underwent a cesarean section, with vaginal deliveries occurring significantly more often than cesarean deliveries. This result aligns with findings where 68% of secondary PPH cases followed vaginal delivery, while 32% occurred after cesarean section. However, it cannot be concluded that vaginal delivery increases the risk of secondary PPH, as the overall rate of vaginal deliveries is higher than that of cesarean deliveries.[24]

All patients presented with per vaginal bleeding. Additionally, 12.5% reported foul-smelling vaginal discharge, 25% had fever, 12.5% were in shock, and 12.5% experienced generalized weakness. In comparison, 28% of patients presented with fever and 8.0% were in shock.[24] Similarly, it was reported that per vaginal bleeding with

shock in 11.11% of cases and fever in 32.32% of secondary PPH cases at presentation.25 Most cases of secondary postpartum hemorrhage (PPH) presented between 8 to 14 days postpartum (40%) and 15 to 21 days postpartum (22.5%). The majority of cases presented in the second week after delivery (33.3%), followed by the third week (28.9%) and the fourth week (17.9%).[23] A significant proportion of secondary PPH patients (70%) exhibited varying degrees of anemia. It was also observed that anaemia was present in 97.6% of secondary postpartum haemorrhage.[25] Retained placental fragments were identified as the primary cause of secondary PPH (52.5%), followed by endometritis and sub-involution (each at 15%). Retained products of conception were the primary cause of secondary PPH in 72% of cases, followed by endometritis in 20%. It was also identified that 34% of postpartum hemorrhage was due to retained placental fragments, 27% was due to uterine wound dehiscence, 24% was caused by retained clots, and 15% was attributed to endometritis.[22] Treatments included dilatation and curettage (42.5%), peripartum hysterectomy (10.0%), tear repair (10.0%), conservative management (20.0%), balloon tamponade (7.5%), uterine exploration (7.5%), and ICU referral (5.0%). Over half of the patients (57.5%) required blood transfusions based on anemia severity. Hospital stays exceeded 5 days for 30% of secondary PPH cases. This result aligns with Nessa et al[22] who reported that 73% of patients had a hospital stay of 5 days, while 27.0% stayed for more than 5 days.

Conclusion

The study revealed that secondary postpartum hemorrhage (PPH) is more commonly associated with women over the age of 25, multiparity, and home or vaginal deliveries. The average length of hospital stay was prolonged, which can impose significant physical, psychological, and financial burdens on the patient and her family. Early recognition and appropriate management are essential to prevent maternal morbidity related to secondary PPH. Active management of the third stage of labor is important in preventing this condition. Following the management of secondary PPH, patients should be advised to attend regular follow-up appointments to mitigate potential long-term adverse effects.

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Original Article

Association of Clinically Diagnosed Anaemia with Walking in Barefoot among Children Studying at a Primary School Living in Rural Community of Bangladesh

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Abstract

Background:Nutritional status is the main concern among the children both under five years of age and primary school going children. Anaemia and malnutrition are likely to be happened in those groups of children especially the primary school going children due to walking in barefoot. ***Objective:*** The aim of the present study was to evaluate the nutritional status of bare-footed children among primary schools' level. ***Methodology:*** This comparative cross-sectional study was undertaken at the Umargong village of Kanaighat Upazila in Sylhet District from October 2010 to March 2011 for a period of 6 months. The children of primary school level at any age of both sexes were included in this study. Clinical examination of the students and anthropometric measurements were recorded accordingly. Anaemia was diagnosed clinically. A predesigned questionnaire was prepared for the collection of data from the children. ***Results:*** A total number of 60 primary school children were taken as case of which 44 were in the age group of less than 10 years with female predominance (76.7%). The height, weight, mid arm circumference and anaemia were examined and found a strong correlation with walking in barefoot and anaemia which is statistically significant (p=0.001). ***Conclusion:*** In conclusion, it may permit to conclude that walking in barefoot by the primary school children is the causes of anemia and malnutrition.

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Introduction:

Anemia remains one of the most significant public health challenges worldwide, particularly affecting children in low- and middle-income countries.[1] Globally, anemia is estimated to affect 43% of children under five, with the prevalence being markedly higher in resource-constrained settings such as rural Bangladesh.[2] Anemia in children is associated with a range of adverse outcomes, including impaired cognitive and physical development, reduced school performance, and increased susceptibility to infections.[3-4] Despite various interventions, addressing the multifactorial nature of anemia in such settings remains challenging.

One of the primary causes of anemia is iron deficiency, which can result from inadequate dietary intake,

malabsorption, or chronic blood loss.[5] In rural areas, soil-transmitted helminth (STH) infections, particularly hookworm infestations, are major contributors to chronic blood loss and anemia in children. Hookworm larvae enter the human body through the skin, typically via the feet, making the habit of walking barefoot a significant risk factor for acquiring these parasitic infections.[6] Rural children, often walking barefoot due to cultural norms or economic constraints, are particularly vulnerable to this route of infection.[7]

Bangladesh, a country with a predominantly agrarian economy, faces a high burden of childhood anemia, with prevalence rates exceeding 50% in some rural regions8. Several factors contribute to this public health issue, including malnutrition, limited access to healthcare, poor hygiene, and inadequate sanitation. Walking barefoot, a common practice among children in rural areas, further exacerbates this situation by increasing exposure to parasitic infections and environmental pathogens.[9] This behavioral risk factor, while modifiable, has received limited attention in public health research and interventions aimed at combating anemia.

One of the causes of malnutrition and anemia among children is soil-transmitted helminthes which are transmitted from person to person through contact with fecally contaminated soil including Ascaris lumbricoides, Trichuris trichiura, the hookworm species (Ancylostoma duodenale and Necator americanus), and Strongyloides stercoralis. Infections are concentrated in poor rural populations throughout sub-Saharan Africa, Asia, and the Americas10. Within Latin America, an estimated 19% of people have trichuriasis, 16% ascariasis and 10% are positive for hookworm infection.[11]

Although causes of malnutrition are multifactorial, helminth infections have been associated with impaired growth and stunting in diverse populations.[12-13] There are several mechanisms by which intestinal parasitism may cause or aggravate malnutrition including impaired nutrient absorption resulting from infection and reduced appetite.[14] Adult helminthes worms residing in the small intestine are in an excellent position to interfere with their hosts' nutrition and can induce damage to the intestinal mucosa that may reduce a person's ability to extract and absorb nutrients from food. Helminthes infection can cause vomiting, diarrhea, anorexia, abdominal pain, and nausea that may result in reduced food intake, thereby further reducing nutrient availability.[11] The most significant cause of nutritional stress resulting from helminthes infections is hookworm associated iron deficiency anemia. Light hookworm infection of 20 to 50 adult worms can result in significant iron losses; furthermore, mild to moderate intensity helminthes infection during childhood have been associated with under nutrition and reduced physical fitness.[13]

Given this context, it is essential to explore the relationship between barefoot walking and anemia to identify actionable interventions. Understanding whether walking barefoot is independently associated with anemia, beyond other socio-economic and nutritional determinants, could provide valuable insights for designing targeted public health strategies. This study focuses on examining this association among children studying in a primary school in a rural area of Bangladesh, where such risk factors are prevalent.[15] The primary school setting offers an ideal context for investigating the interplay between anemia and behavioral factors such as barefoot walking. Schools serve as both a point of health surveillance and a platform for implementing interventions, such as deworming programs, nutrition education, and awareness campaigns about personal hygiene. By studying children in this environment, we can also gain insights into how environmental and behavioral determinants affect health outcomes in a population that represents the future workforce and productivity of the country.[16]

By focusing on this association, the study seeks to highlight the need for integrated interventions addressing both behavioral and environmental factors contributing to anemia. Findings from this research could inform policies and programs aimed at reducing the burden of anemia among rural children in Bangladesh and similar contexts, thereby improving their overall health and development outcomes.

The objective of this study was to assess the association between clinically diagnosed anemia and the habit of walking barefoot among rural primary schoolchildren. Specifically, it aims to determine the prevalence of clinically diagnosed anemia among the children, to evaluate the proportion of children who regularly walk barefoot and to assess the strength of the association between walking barefoot and anemia after adjusting for other potential confounders such as dietary intake, socioeconomic status, and hygiene practices.

Methodology

Study Settings and Population: This comparative cross-sectional study was carried out in the Batoiail village

under Kanaighat subdistrict in Sylhet district of Bangladesh which is situated at the North-East corner of Bangladesh from October 2010 to March 2011 for a period of six months. The primary school children studying at the level of class I to class V at any age of both sexes were included in this study.

Study Procedure: Computer generated simple random number were taken. The children were clinically examined by a expert physician to diagnosed anaemia clinically. The grading of the anemia was done by the severity of the anaemia into mild, moderate and severe. A single investigator carried out statistical study within limited period of time. Prior to the commencement of this study, the research protocol was approved by the Local Ethical Committee of BIAM, Dhaka. The aims and objectives of the study were explained to the patients in easily understandable local language. It was assured that all informed and records were kept confidential and the procedure was helpful for both the physician and the patients in making rational approach of the case management.

Statistical Analysis: All the statistical test were performed in Statical Package for Social Science (SPSS version 20.0) Qualitative data were expressed as frequency and percent. The quantitative data were expressed as mean with standard deviation. P value less than 0.05 was taken as statistically significant.

Ethical Clearance: All procedures of the present study were carried out in accordance with the principles for human investigations (i.e., Helsinki Declaration 2013) and also with the ethical guidelines of the Institutional research ethics. Formal ethics approval was granted by the local ethics committee (Ref: IRB/NINS/244). Participants in the study were informed about the procedure and purpose of the study and confidentiality of information provided. All participants consented willingly to be a part of the study during the data collection periods. All data were collected anonymously and were analyzed using the coding system.

Results

A total number of 60 children from the primary school were selected as study population after fulfilling the inclusion and exclusion criteria. Among 60 respondent's majority were less than 10 years of age which was 44(73.4%) and the rest 16(26.6%) cases were in the more than 10 years of age. The mean age was 9.83±1.304 with the range of 8 to 13 years (Table 1).

Table 1: Age Distribution among the Study Population (n=60)

Age group	Frequency	Percent
≤10 Years	44	73.4
≥10 Years	16	26.6
Total	**60**	**100**
Mean±SD	9.83±1.304 (range: 8 -13)	

The maximum was without anaemia which was in 38(63.3%) and mild was in 14(23.3%) cases.

Table 2: Distribution of Study Population according to Level of Anemia (n=60)

Level of anemia	Frequency	Percent
Mild	14	23.3
Moderate	7	11.7
Severe	1	1.7
No Anemia	38	63.3
Total	60	100.0

The students walking in barefoot were anaemic which was statistically significant (p=0.001).

Table 3: Comparison of walking in bare-foot and anemia

Anemia	Walking in bare-foot		Total	P value
	Yes	No		
Mild	10	4	14	
Moderate	5	2	7	
Severe	0	1	1	0.001*
No Anemia	7	31	38	
Total	**22**	**38**	**60**	

*Chi-square test is done to measure the level of significance.

Discussion

Walking in barefoot causes soil-transmitted helminthes infection and has been associated with impaired growth and stunting among the children of primary school level.[2] The most significant cause of nutritional stress resulting from helminthes infection is hookworm associated iron deficiency anemia. Walking in barefoot among the children causes anemia significantly. Malnutrition is also found among the children of primary school level due to walking in barefoot.[14] A large-scale study should be done to get the real scenario. Stool examination should be done for conclusive diagnosis. Antihelminthic should be properly implement to the primary school level students to eliminate hook worms. Hemoglobin estimation by taking blood should be done for accurate diagnosis of anemia.[16] The findings of this study highlight a significant association between walking barefoot and clinically diagnosed anemia among children attending a primary school in a rural area of Bangladesh. This relationship underscores the potential role

of environmental and behavioral factors in influencing child health outcomes, particularly in low-resource settings. Anemia in children is a multifaceted public health challenge, influenced by nutritional deficiencies, infections, and socioeconomic factors.[17-21] The association between walking barefoot and anemia is likely mediated through an increased risk of parasitic infections, particularly soil-transmitted helminths (STH) such as hookworms. Hookworm infections are well-documented causes of iron-deficiency anemia, as the parasites attach to the intestinal mucosa and cause chronic blood loss.[22] Walking barefoot in contaminated environments facilitates direct contact with soil harboring infective larvae, increasing the risk of such infections.[23] This finding aligns with previous studies from similar rural settings, where barefoot walking has been identified as a major risk factor for STH transmission.

The observed association remained significant even after adjusting for potential confounders such as dietary intake, socioeconomic status, and hygiene practices.[24] This suggests that the habit of walking barefoot may independently contribute to the risk of anemia, beyond other commonly recognized factors. It also highlights the importance of addressing environmental sanitation and personal protective measures, such as the use of footwear, as part of comprehensive public health strategies to combat anemia.[25]

In addition to parasitic infections, other mechanisms could explain the association. For example, walking barefoot in rural areas often exposes children to injuries or infections, which may contribute to chronic inflammation and impaired nutrient absorption.[26] Furthermore, children from poorer households, who are more likely to walk barefoot due to economic constraints, may also face greater barriers to accessing adequate nutrition and healthcare. This overlap of behavioral, environmental, and socioeconomic vulnerabilities creates a synergistic effect, exacerbating the risk of anemia.[27-28]

This study's findings have important implications for public health interventions in similar settings. Promoting the consistent use of footwear among children should be a priority in reducing the risk of parasitic infections and, consequently, anemia. School-based health programs can play a pivotal role in creating awareness about the health benefits of wearing shoes, alongside regular deworming initiatives and nutritional supplementation.[21] Integrating such measures into existing health and education programs could yield substantial improvements in child health outcomes.

While this study provides valuable insights, it is essential to consider its limitations. The cross-sectional design precludes the establishment of causation, and the reliance on clinically diagnosed anemia may have resulted in underdiagnosis or misclassification. Future studies should incorporate laboratory-confirmed hemoglobin levels and stool examinations to assess parasitic infections directly. Longitudinal research could further elucidate the causal pathways linking barefoot walking to anemia and identify additional risk factors.

Another limitation is the potential for residual confounding by unmeasured variables, such as genetic predispositions to anemia or variations in local soil contamination levels. Additionally, the study's focus on a single school in a specific rural area limits the generalizability of the findings. Broader studies encompassing diverse geographic regions and cultural practices would provide a more comprehensive understanding of the issue.

Conclusion

In conclusion, this study highlights a significant association between walking barefoot and anemia among rural schoolchildren in Bangladesh. Addressing this behavioral risk factor, alongside nutritional and healthcare interventions, is crucial for tackling the multifaceted burden of anemia. By promoting the use of footwear, improving sanitation, and implementing integrated health programs, policymakers can contribute to breaking the cycle of poor health and poverty in vulnerable populations.

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Review Article

Resurgence of Diphtheria: A Narrative Review

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Abstract

Background: Changes in the epidemiology of diphtheria are occurring worldwide. Waning immunity to diphtheria was observed over time after childhood vaccination. After immunization in childhood, appropriate re-vaccinations are omitted for various reasons. Fear of adverse reactions in the course of diphtheria booster vaccination bears much of the responsibility. A large proportion of adults in many industrialized and developing countries are now susceptible to diphtheria. Inadequate boosting of previously vaccinated individuals may result in increased risk of acquiring the disease from a carrier, even if adequately immunized previously. The continuous circulation of toxigenic C. diphtheriae emphasizes the need to be aware of epidemiological features, clinical signs, and symptoms of diphtheria; so that cases can be promptly diagnosed and treated, and further public health measures can be taken to contain this serious disease.

Key Words: Diphtheria; immunization; re-emergence; epidemiology

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Introduction:

Diphtheria is an ancient disease, known since the time of Hippocrates. Diphtheria is a highly-contagious life threatening disease caused by toxigenic strains of Corynebacterium diphtheriae an aerobic Gram-positive bacterium, which are transformed by a bacteriophage carrying the toxin gene. Diphtheria causative agent and its major virulence factor diphtheria toxin are well studied, but outbreaks of disease still occur worldwide.[1] Diphtheria is generally an upper respiratory tract illness characterized by sore throat, low-grade fever, and an adherent membrane (a pseudomembrane) on the tonsil, pharynx or nose. A milder form of diphtheria is limited to the skin.[2] Complications may include myocarditis, inflammation of nerves, kidney problems, and bleeding problems due to low blood platelets. Myocarditis may result in an abnormal heart rate and inflammation of the nerves may result in paralysis.[3] Most of the clinical manifestation of diphtheria results from the action of an exotoxin produced by the pathogen. Diphtheria toxin (DT) produced by toxigenic strains of C. diphtheriae is considered as the main pathogenic factor of infection. Toxigenicity of C. diphtheriae is controlled by bacteriophage conversion. Thus toxin production occurs only when the bacterium is infected by lysogenic Corynephage carrying the tox gene encoding DT.[1] Humans are the only natural host of C.diphtheriae. Both toxigenic and non-toxigenic organisms reside in the upper respiratory tract and are transmitted by airborne droplets. The sites of infection are fauces, nose, larynx, conjunctiva, vulva, vagina, wound and ear.[3] The organism can also infect the skin at the site of a pre-existing skin lesion. This occurs primarily in the tropics but can occur worldwide in indigent persons with poor skin hygiene.[4] Overcrowding, poor health, substandard living conditions, incomplete immunization and immunocompromised states facilitate susceptibility to diphtheria and are risk factors associated with transmission of this disease.[5] Although diphtheria is now reported infrequently in the world, in the pre-vaccine era, the disease was one of the most common causes of illness and death among children.[2] Outbreaks though very rare, still occur worldwide, even in developed

nations. After the breakup of the former Soviet Union in the late 1980s, vaccination rates in its constituent countries fell so low that there was an explosion of diphtheria cases.[3] Between 1990 and 1998, the countries of the former Soviet Union reported more than 1,50000 cases and 5000 deaths, which represented more than 80 percent of diphtheria cases reported globally.[5] It was the largest diphtheria epidemic since the 1950s, when widespread diphtheria immunization began.[6] Today diphtheria evolves from children's disease into disease affecting predominantly, adults, with severe respiratory forms of infection.[7] Despite the widespread use of immunization, diphtheria remains endemic in several regions including Africa, India, Bangladesh, Nepal, Indonesia, Vietnam, the tropics and areas of South America including Brazil.[1] However, the majority of the adult populations in Europe, Australia and the United States have no immune protection against this infection. Diphtheria remained endemic in some states of United States through the 1970s, with reported incidence rates of greater than 1.0 per million population in Alaska, Arizona, Montana, Mexico, South Dakota and Washington.[5] Most of these infections were attributed to incomplete vaccination. In the United States, diphtheria currently occurs sporadically, mostly among the Native American population, homeless people, lower socioeconomic groups, and alcoholics. Immigrants and travelers from regions with ongoing epidemics are also at risk.[5] This issue draws renewed attention to the immunology of this infection, because lowered immunity levels within population can cause outbreaks of diphtheria.[1]

The reasons for re-emergence of epidemic in countries where immunization programs had nearly eliminated are not fully understood but are thought to include-The introduction of toxigenic C.diphtheriae strains of a new biotype into the general population; The low coverage with diphtheria vaccine among children; crowding and poor personal hygiene have contributed to transmission and increase in diphtheria infections in adults.[8] Importation of the microorganism from regions where diphtheria remains endemic also poses a constant threat, particularly among subgroups of individuals with low vaccination levels. Between 1986 and 1994 the majority of toxigenic strains isolated in the United Kingdom was imported from the Indian subcontinent, Pakistan, Africa, Somalia and the Tropics.3 In Netherlands, the introduction of diphtheria into religious communities, refusing vaccination constituted a danger of spread of the bacterium, as more than 60% of orthodox reformed persons had no protective diphtheria antibody levels.[8] In the last 10 years, there have been a number of reports of either re-emergence or persistence of diphtheria from several Indian states including Andhra Pradesh, Delhi, Assam, West Bengal etc.[9] The data on vaccine-preventable diseases provided by the Government of India to the World Health Organization (WHO) during 1980-2008 indicated persistence of diphtheria without much decline over the last 25 years.[3] India accounted for 19-84% of the global burden of diphtheria from 1998 to 2008.[9] These data brought out important features about the epidemiology of diphtheria in India. For example, the disease, which was common among under five children in the past, is now affecting older children (5-19 years) and adults. Persistence or resurgence of diphtheria in the country was mainly due to low coverage of primary immunization as well as boosters.[10] India has accounted for 3,123 cases of the total of 4,053 cases (77.05%) reported in the world in 2010.[11] As India is our neighboring country, this data is of particular concern for us. In Bangladesh however there is continuous occurrence of few cases of diphtheria in every year. During the year from 2011 to 2015 in Bangladesh number of diphtheria cases were serially 11,16,02,13 and 06.[12] The reasons for the recrudescence of diphtheria are the decreasing immunity due to relaxation of endeavors for appropriate vaccination and the introduction of toxigenic pathogens, especially from developing countries and from the East. In the absence of antigen stimulation by circulating toxigenic diphtheria bacteria strains or without regular booster vaccinations, the protective antibody titres fall below the protective threshold. Unprotected persons then do not only have a high individual risk, but also once more enable spreading of diphtheria on an epidemic scale.[13]

Epidemiology

At the beginning of the 1980s, many countries in the world were progressing toward the elimination of diphtheria.[3] Diphtheria incidence rates reached their lowest levels, and there was optimism that elimination of indigenous respiratory diphtheria could be achieved in the European Region by 1990 by maintaining and strengthening immunization services.[13] However, a striking resurgence of epidemic diphtheria in the Newly Independent States (NIS) of the former Soviet Union has drawn attention to our lack of a full understanding of the epidemiology of the disease.[14] The epidemic began in the Russian Federation at the end of the 1980s and had affected all 15 NIS countries by the end of 1994.[15] Since 1992, some of the diphtheria cases reported

from other parts of Europe have been linked to transmission from the NIS epidemic: in Belgium, in England and Wales, in Finland, in Germany, and in Greece.[16] In Poland, 19 of 25 persons diagnosed with diphtheria in 1992–1995 had traveled to Russia, Ukraine, or Belarus or had contact with visitors from these countries.[17] Importation of diphtheria cases to European countries and Mongolia and diphtheria cases among US citizens traveling or residing in the NIS gave rise to the fear that the NIS epidemic might spread over a wider area.[14] As late as 1997, as the epidemic was waning, the NIS countries reported <40% of the diphtheria cases worldwide.[13,14]

The diphtheria epidemic in NIS provided important information. First, there was a high proportion of cases among adolescents and adults, especially in Belarus, Russia, Ukraine, and in Baltic States (Estonia, Latvia, and Lithuania), and a lower proportion of cases in these age groups in the southern republics of the Caucasus area and Central Asia.[18] Second, the epidemic began as an urban epidemic, with a progressive transition to include rural areas over time. Third, the epidemic initially amplified in groups with high rates of close contacts (e.g., hospitals, military troops, kindergartens, schools), and later, it made a transition to a more generalized epidemic involving socioeconomically disadvantaged groups (e.g., alcoholics). The Soviet armed forces may have played a role in the introduction and spread of toxigenic Corynebacterium diphtheriae, and several diphtheria outbreaks were reported in Russia among military staff. Military recruits were not routinely vaccinated against diphtheria until 1990.[16,18] The first cases of diphtheria in Moscow in 1990 were among paramilitary construction workers. From May 1988 to February 1989, the demobilization of 100,000 Soviet troops who had served in Afghanistan, where endemic diphtheria was reported, may have contributed to the introduction and spread of toxigenic strains of C.diphtheriae.[19]

In developing countries, high levels of vaccination of infants with diphtheria-tetanus toxoids-pertussis vaccine (DTP) have been achieved following implementation of the Expanded Program on Immunization of the World Health Organization (WHO) in the 1970's (WHO 1984).[11] Despite the widespread use of immunization, diphtheria remains endemic in several regions including Africa, India, Bangladesh, Vietnam, the tropics and areas of South America, including Brazil. Several countries where coverage has been high for 5-10 years have reported diphtheria outbreaks.[20] High case fatality rates, a large proportion of patients with complications, and their occurrence in both young and older age groups characterized these outbreaks.[8] The diphtheria epidemic in NIS provided important information. First, there was a high proportion of cases among adolescents and adults, especially in Belarus, Russia, Ukraine, and in Baltic States (Estonia, Latvia, and Lithuania), and a lower proportion of cases in these age groups in the southern republics of the Caucasus area and Central Asia.[18] Second, the epidemic began as an urban epidemic, with a progressive transition to include rural areas over time. Third, the epidemic initially amplified in groups with high rates of close contacts (e.g., hospitals, military troops, kindergartens, schools), and later, it made a transition to a more generalized epidemic involving socioeconomically disadvantaged groups (e.g., alcoholics). The Soviet armed forces may have played a role in the introduction and spread of toxigenic Corynebacterium diphtheriae, and several diphtheria outbreaks were reported in Russia among military staff. Military recruits were not routinely vaccinated against diphtheria until 1990.[16,18] The first cases of diphtheria in Moscow in 1990 were among paramilitary construction workers. From May 1988 to February 1989, the demobilization of 100,000 Soviet troops who had served in Afghanistan, where endemic diphtheria was reported, may have contributed to the introduction and spread of toxigenic strains of C.diphtheriae.[19]

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In the last 10 years, there have been a number of reports of either reemergence or persistence of diphtheria from several Indian states, including Andhra Pradesh, Delhi, Maharashtra, Chandigarh, Gujarat, Assam, West Bengal, Madhya Pradesh, Uttar Pradesh, Rajasthan and Haryana.[9] The data on vaccine preventable diseases provided by the Government of India to the World Health Organization (WHO) during 1980-2008 indicate

persistence of diphtheria without much decline over the last 25 years.[20] India accounted for 19-84% of the global burden from 1998 to 2008.[10]

These reports bring out certain important features about the epidemiology of diphtheria in India. First, the disease, which was common among under five children in the past, is now affecting older children (5 to 19 years) and adults. Second, in certain states, the disease is common among females and Muslims. Third, the majority of the cases are reported from children who were unimmunized/partially immunized against diphtheria. Persistence or resurgence of diphtheria in the country was mainly due to low coverage of primary immunization as well as boosters. According to the WHOUNICEF estimates, the DPT3 coverage was 66% in 2008, whereas as per the three National Family Health surveys, DPT3 coverage during 1992–2006 was only 52–55%.[11] Because the immunity acquired through primary immunization wanes in early childhood, adequate coverage of booster doses is equally important.[10]

Evolution of the disease

Incubation period: usually 2-4 days.[4] The toxigenic strains of C. diphtheriae after colonizing the tissue of susceptible individual remain localize at the site. Here they multiply and cause coagulative necrosis producing a typical grayish white false membrane. They liberate a powerful exotoxin.[4] The toxin by the help of its spreading factor is absorbed into the circulation and gets fixed to cells of various organs. For a time this union is dissociable but afterwards permanent fixation takes place. The toxin kills the cells by interfering with its protein synthesis.[3]

Pathogenesis

The principal human pathogen of the genus Corynebacterium is Corynebacterium diphtheriae, the causative agent of respiratory or cutaneous diphtheria. In nature, Corynebacterium diphtheriae occurs in the respiratory tract, in wounds or on the skin of infected persons or normal carriers. It is spread by droplets or by contact to susceptible individuals; the bacilli then grow on mucous membranes or in skin abrasions, and those that are toxigenic start producing toxin.[4] All toxigenic Corynebacterium diphtheriae are capable of elaborating the same disease-producing exotoxin. In vitro production of this toxin depends largely on the concentration of iron. Toxin production is optimal at 0.14 μg of iron per milliliter of medium but is virtually suppressed at 0.5 μg/mL.[21] Other factors influencing the yield of toxin in vitro are osmotic pressure, amino acid concentration, pH, and availability of suitable carbon and nitrogen sources. The factors that control toxin production in vivo are not well understood. Diphtheria toxin is a heat-labile polypeptide (molecular weight [MW], 62,000) that can be lethal in a dose of 0.1μ g/kg.[22] If disulfide bonds are broken, the molecule can be split into two fragments. Fragment B (MW, 38,000), which has no independent activity, is functionally divided into a receptor domain and a translocation domain. The binding of the receptor domain to host cell membrane proteins CD-9 and heparin-binding epidermal growth factor (HB-EGF), triggers the entry of the toxin into the cell through receptor-mediated endocytosis.[23] Acidification of the translocation domain within a developing endosome leads to creation of a protein channel that facilitates movement of fragment A into the host cell cytoplasm. Fragment A inhibits polypeptide chain elongation—provided nicotinamide adenine dinucleotide (NAD) is present—by inactivating the elongation factor EF-2. This factor is required for translocation of polypeptidyl-transfer RNA from the acceptor to the donor site on the eukaryotic ribosome. Toxin fragment A inactivates EF-2 by catalyzing a reaction that yields free nicotinamide plus an inactive adenosine diphosphate-ribose-EF-2 complex (ADP-ribosylation). It is assumed that the abrupt arrest of protein synthesis is responsible for the necrotizing and neurotoxic effects of diphtheria toxin.[24]

Pathology

Diphtheria toxin is absorbed into the mucous membranes and causes destruction of epithelium and a superficial inflammatory response. The necrotic epithelium becomes embedded in exuding fibrin and red and white cells, so that a grayish “pseudomembrane” is formed—commonly over the tonsils, pharynx, or larynx.[4] Any attempt to remove the pseudomembrane exposes and tears the capillaries and thus results in bleeding. The regional lymph nodes in the neck enlarge, and there may be marked edema of the entire neck, with distortion of the airway. The diphtheria bacilli within the membrane continue to produce toxin actively. This is absorbed and results in distant toxic damage, particularly parenchymatous degeneration, fatty infiltration, and necrosis in heart muscle (myocarditis), liver, kidneys (tubular necrosis), and adrenal glands, sometimes accompanied by gross hemorrhage.[25] The toxin also produces nerve damage (demyelination), often resulting in paralysis of the soft palate, eye muscles, or extremities. Wound or skin diphtheria occurs chiefly in the tropics,

although cases have also been described in temperate climates among alcoholic, homeless individuals and other impoverished groups.[25] A membrane may form on an infected wound that fails to heal. However, absorption of toxin is usually slight and the systemic effects negligible. The small amount of toxin that is absorbed during skin infection promotes development of antitoxin antibodies. The "virulence" of diphtheria bacilli is attributable to their capacity for establishing infection, growing rapidly, and then quickly elaborating toxin that is effectively absorbed. Corynebacterium diphtheriae does not actively invade deep tissues and practically never enters the bloodstream.[26]

Changes in Immunity Patterns by Age Changes in the age-wise distribution of the immunity patterns usually have been explained by the argument that immunization led to a marked decrease in the incidence of the disease and to a subsequent reduction of the reservoir of toxigenic C. diphtheriae organisms. In the pre-vaccine era, exposure to toxigenic strains of diphtheria organisms was common, and this provided natural boosts to the development and maintenance of immunity against diphtheria.[27] Children were susceptible, and most adults remained immune to the disease. However, after immunization of children became widespread, diphtheria became rare, so exposure to these bacteria (and the concomitant natural boost of immunity) become uncommon. If adults do not have natural exposure to diphtheria-causing organisms or receive booster doses of diphtheria toxoid, their immunity induced by childhood immunization wanes, and they become susceptible to the disease.[28] A large body of evidence has documented changes in the immunity levels of various age groups in the pre and post-vaccine eras. In the pre-vaccine era, when the circulation of C. diphtheriae organisms was common and the prevalence of diphtheria cases was high, natural immunity was acquired by overt or subclinical infection.[29] Most newborn infants passively acquired antibodies from their mothers via the placenta. In 1914 in Vienna and in 1923 in New York City, 80% of newborns showed evidence of diphtheria immunity.[16,18] During the first several months of life, this passive immunity waned and was gradually replaced by active immunity, which was acquired through increasing exposure to natural infection. By 15 years of age, 80% of the children had acquired natural immunity against diphtheria. The rate of acquisition of natural immunity, however, differs from country to country, probably due to differences in the intensity of early contact with diphtheria organisms, overcrowding, sanitation, and hygiene. Available data suggest that the pattern of acquiring diphtheria immunity in developing countries in the 1960s and 1970s resembled the pattern observed in Europe and the United States before the introduction of childhood immunization programs.[15] Infections of skin lesions with C.diphtheriae organisms seem to play a role in the rapid development of natural immunity in developing countries. In areas where diphtheria has been controlled through immunization programs, the immune status of the population has changed considerably: Children have high levels of diphtheria immunity as a result of childhood immunization.[27] The level of immunity declines in late childhood and adolescence, depending on the schedule of immunization and the remaining reservoir of C. diphtheriae in the population. Without the periodic administration of booster doses of diphtheria toxoid or repeated exposure to toxigenic strains of C.diphtheriae, adults become susceptible to diphtheria.[30] The likelihood of having protective antibody levels decreases with age, and in some industrialized countries, 50% of adults are susceptible to diphtheria. Although the design and laboratory methods used in different sero surveys conducted in different countries and at different times varied considerably, the results of the sero surveys suggested a clear shift in the immunity distribution in different age groups.[27] This gap of immunity among adults exists in many industrialized countries: France, Germany, Norway, and Italy. In Germany, newborns and persons 50 years of age constituted the least protected groups. In the early 1980s, the lowest levels of diphtheria antibodies in various areas of the Soviet Union were found in persons 20–40 years old, and at present, this least protected group has shifted to persons 30–40 years old.12 In other countries, low-level protection was found in persons 40–50 years old in Australia, England, Germany, and Poland and in persons 50 years old in Denmark, Finland, Sweden and the United States.[15] A lower percentage of adults, especially men, in the north western areas of Russia have protective levels of diphtheria antitoxin compared with adults in northern Norway.[18] Thus, a high proportion of the adult population in industrialized countries lacks immunity and remains susceptible to diphtheria. A large pool of susceptible adults constitutes the potential for an epidemic, especially if this pool is coupled with the presence of susceptible children.[13]

Changes in the Age Distribution of Diphtheria Cases

When diphtheria was a common disease, it most frequently affected children: At least 40% of diphtheria cases were among children< 5 years of age, and some 70% of the cases

were among children< 15 years of age.[18] Shifts in the age distribution of diphtheria case has usually been explained by the impact of immunization. However, historical data show that a shift of the disease to older ages began before mass immunization was introduced. Many European countries experienced diphtheria outbreaks during World War II, and it was estimated that in 1943 alone, there were a million cases of diphtheria in Europe, with 50,000 deaths.[8] Changes in the age distribution have been observed in many countries. In Netherlands, Norway and Denmark a sharp shift toward infection in older persons was seen in the 1940s. In Netherlands, the proportion of diphtheria cases in persons 18 years of age rose from 6% in 1930 to 37% in 1944. In 1944, an epidemic of diphtheria started in Copenhagen of 2200 cases, 1500 (68%) were among adults.[12] This outbreak may have been the result of a documented fall in immunity to diphtheria in adults in Copenhagen during the late 1930s, which was thought to have been due to a period when the incidence of diphtheria was low. The most interesting changes occurred in Germany, where diphtheria was endemic before World War II and where an alarming rise in the incidence of diphtheria was seen beginning in 1941.[16] Frequent references were made to the spread of malignant diphtheria in Germany in the early 1940s, the course of which was so rapid that serum therapy, even at a very early stage of disease development, had no effect.[31] Unexpectedly, the proportion of adult patients rose concomitantly with the overall rise in diphtheria incidence. In 1943, more than half of the diphtheria cases reported were among adults. This was a clear change in the age distribution of diphtheria patients in Germany from the beginning of the twentieth century, when only 1%–2.5% of diphtheria cases were among adults. Furthermore, among all diphtheria deaths reported, those involving adults also increased (from 12% in 1939 to 48% in 1943). Diphtheria was also an important cause of death in the German army, particularly as a complication of chest wounds and typhus.[32] In addition, the extent of vaccination against diphtheria during World War II was probably too small to change the age distribution of cases. All these observations suggest that changes in the age distribution of diphtheria cases resulted from factors other than vaccination. Socioeconomic factors, such as a general increase in the standard of living, smaller families, and less overcrowding, created an environment in which children were not subjected to the same intensity of infection in their preschool years as they had been previously. On the other hand, increasing enrollment in schools, summer camps, and meetings of children, adolescents, and adults from different neighborhoods and social backgrounds probably contributed to wider circulation of C.diphtheriae within these age groups.[9] Likewise, migration and displacement of many people during World War II probably enhanced the circulation of diphtheria organisms and contributed to the shift toward more adult cases. In many areas of Germany late in World War II, conditions were far from normal. People were at work during the day and in overcrowded bomb shelters at night. They were under constant stress, which was reinforced by shortages of food, water, and electricity. Some of these conditions enhanced the transmission of infection. Recent outbreaks of diphtheria in Europe and the United States have occurred in poor, socio economically disadvantaged groups living in crowded conditions. Crowding and poor personal hygiene may contribute to transmission and an increase in diphtheria infections. An epidemic of diphtheria that occurred in the United States in the early 1970s mainly affected adults from low socioeconomic groups who were heavy alcohol users. The role of cutaneous diphtheria has been emphasized by several diphtheria outbreaks in the United States among homeless alcoholic men and impoverished groups.[8]

Changes in the Epidemiology of Diphtheria in Developing Countries

Changes in the epidemiology of diphtheria are also occurring in developing countries. In such countries, a high rate of skin infections caused by C.diphtheriae creates a primary reservoir of diphtheria organisms, and the circulation of C.diphtheriae organisms still appears to be an important factor in the early development of natural immunity against diphtheria. However, the epidemiologic patterns of diphtheria may be changed by (1) successful immunization programs among children. (2) Socioeconomic changes (including migration from rural to urban areas and sociocultural changes with improving hygiene) and (3) changing lifestyles. With these changes, diphtheria can emerge as an epidemic disease, with more serious forms of the disease attacking older children, adolescents, or adults. As an example, diphtheria outbreaks in developing countries in the last 2 decades document a shift in age distribution similar to the shift witnessed in industrialized countries 30–40 years ago. The shift to older age groups seems to occur in two stages: In the first stage, the disease mainly attacks school children (Jordan1977–1978, Algeria1993–1996), and in later stages, the age distribution shifts to adolescents and young adults

(Jordan 1982–1983, Lesotho 1989, China 1988–1989). These outbreaks have been characterized by high case fatality rates, a large proportion of patients with complications, and the occurrence of the disease in both young and older age groups.[6-8] A high-incidence outbreak (118/1000 population) reported in preschool children in Yemen and diphtheria outbreaks in Jordan and Sudan demonstrated these changing age patterns. Outbreaks in Lesotho and Algeria occurred after periods of high immunization coverage.[21] In a province of China, after a period of low incidence (3 years with no diphtheria cases), an outbreak occurred with 70% of cases in persons 20 years of age. In a diphtheria epidemic in Algeria and in Ecuador, most cases were reported among older children, adolescents, and young adults.[13]

Situation in Bangladesh

Diphtheria is an important public health problem in Bangladesh and at times it reaches epidemic proportions. In the vast majority of instances the disease strikes the pre-school children (< 5 years). All the three biotypes are encountered in Bangladesh, but the gravis type is most frequently isolated. Next in frequency is the mitis type, intermedius being the least common.[3]

In Bangladesh however there is continuous occurrence of few cases of diphtheria in every year.

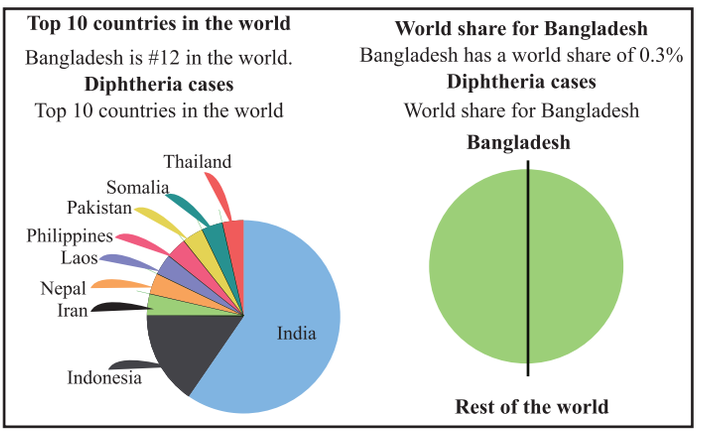

Figure: Diphtheria cases in the world 2016.[3]

The impact of routine childhood immunization on the epidemiology of many diseases is well known. A clear example is the dramatic decline in the incidence of diphtheria in industrialized countries. In parallel, many of these countries have realized that large segments of their adult populations are susceptible to diphtheria as a consequence of the decrease in the asymptomatic carrier status of toxigenic Corynebacterium diphtheriae and of the natural boosters that used to occur in the pre-vaccination era. When the circulation of toxigenic strains of C. diphtheriae is reduced, repeated doses of diphtheria toxoid are needed to maintain immunity in the adult population. However, acquisition of immunity against other diseases has not changed with time: protection against tetanus, for instance, can only be achieved through vaccination of each individual and subsequent boosters are needed in order to maintain protective antibody levels. Vaccination of the elderly population has now been recommended as a routine in some countries. Assessing immunity to vaccine-preventable diseases in the elderly is necessary in order to provide a correct immunization scheme. In Brazil, the First National Influenza, Pneumococcus, Tetanus and Diphtheria Vaccination Campaign for the Elderly took place in 1999.[15] Diphtheria is still a great public health concerns in many developing countries. During the past two decades, in spite of the low incidence of diphtheria in developed countries, limited outbreaks have been reported in the United States and parts of Europe.[8] So there is concern about outbreaks of these diseases especially in developing countries. After vaccination programs children are not threatened group by these diseases and recent cases are more common in the adult population. Vaccination against diphtheria has resulted in a fast decrease in morbidity and mortality due to this diseases . According to the current Iranian National Immunization program a primary series of 4 doses is recommended, with a booster dose at 4 to 6 years of age. A primary series of 3 doses is required if the vaccine is first administered after 7 years of age. Boosters of DT vaccine for adult are recommended every 10 years. When more than thirty percent of a population are non-immunized against diphtheria there is a chance of epidemic diphtheria occurring in that community. In order to achieve adequate levels of herd immunity and to prevent outbreaks, it is obligatory to analyze the immunity levels of the general population and to identify and vaccinate insufficiently protected groups.[33] Bangladesh has already achieved UN award in 2010 for fulfilling all the parameters of MDG goal including EPI coverage. So to achieve Sustainable Development Goal (SDG) it is important to focus on maintaining the immune status against communicable diseases like diphtheria.

Assessment of anti-diphtheria protection

Serologic methods of diphtheria diagnosis based on the detection of diphtheria toxin or on increased level of antitoxic antibodies.

Therefore, measurement of antitoxin level in diphtheria patients could provide important clinical information about course of infection. In addition, determination of anti-toxin antibodies is essential for characterization of the immune status of population, and evaluation of the immunogenicity of diphtheria vaccines in clinical trials, as well as for monitoring long-term immunity and thus provides recommendations for vaccination policy. Data obtained from serological studies serve as an important guide in choosing of local strategy of vaccination. Detecting the existence of a cohort of susceptible subjects can predict the risks for disease outbreaks. Therefore, it is of critical importance to have methods for assessment of anti-diphtheria immunity that are accurate, reproducible, specific, and sensitive. Most symptoms of diphtheria are resulted from the diphtheria toxin action; therefore, protection against disease depends on antibody level against the toxin (antitoxin). The assessment of the anti-diphtheria protection in healthy population is common for a surveillance system within any National Program of Immunization. Antitoxic antibodies probably play a main role in the immunity against diphtheria. Serum titers of antitoxin usually are expressed in International Units per milliliter (IU/ml) according to the diphtheria antitoxin standard. The cut-off of protective serum level of antitoxin is 0.01 IU per ml. (but it also depends on the method of titer determination). As believed, the powerful anti-toxin immunity (>1.0 IU/ml) can completely protects the body from infection caused by toxigenic strains. Although, the very little is known about protection associated with non-toxigenic strains. Classical serological tests tend to underestimate low concentrations of diphtheria antibody. That is why antitoxin level under 0.1 IU per ml could not be defined precisely in many laboratories where hemagglutination test is used for this purposes.[1] Numerous in vivo and in vitro tests for the measuring of diphtheria antitoxin levels in serum have been standardized and implemented for laboratory practice. Among the in vivo protocols are the Schick test in humans and the classical toxin neutralization (TN) assay in rabbits or guinea pigs. There is also the in vitro toxin neutralization test in microcell culture plates using highly sensitive Vero (green monkey renal epithelium) cell line. Several in vitro serologic techniques for diphtheria antitoxin determination are described.[1]

Immunity to diphtheria

Diphtheria toxin produced by C. diphtheriae during the disease or the carrier state has ability to induce production of naturally acquired antibodies against the toxin (anti toxin). Artificial immunity to diphtheria can be stimulated with diphtheria toxoid immunization. Antitoxin can pass through the placenta providing passive immunity to the infant during the first few months of life. Patients can acquire passive immunity to diphtheria by injection of equine antitoxin in course of the disease therapy. As supposed, the primary role in the protection against diphtheria belongs to the antibodies of IgG class, but protection potential of IgA and IgM antibodies is remains underestimated. As mentioned earlier, antibodies to B fragment of DT are more protective than antibodies to A-fragment. Recovery from diphtheria is also associated with activity of phagocytes at site of infection. However, there is little known about cell mediated immune responses to toxin or toxoid and other antigenic substances of C. diphtheriae.[1]

Passive immunity to diphtheria

Passive immunity to diphtheria can occur naturally when maternal antibodies are transferred to the fetus through the placenta. Thus, most infants have protective antitoxin level acquired passively from their mothers. However, the half-life of passively acquired antitoxin by newborns is about 30 days, thus level of these antibodies significantly decreases between 6 and 12 months. Mothers and their infants have highest diphtheria antitoxin titers (above 0.1 IU/ml) in areas with normal circulation of toxigenic C. diphtheriae in population. High titers of maternal antibodies can interfere with serologic response of infants to diphtheria vaccination. The modifying effect of passively-acquired maternal antibodies in young infants is strongest under the age of 4 weeks. High titers of passively transferred antibodies may temporarily interfere with active immunization of infants. Maternal transferred antibodies may suppress responses to the first or second vaccination. Thus in the countries where circulation of toxigenic C. diphtheriae is common the early immunization of infant is not so effective due to the presence of high level of maternal antitoxin. At the other hand, early immunization of these infants can deplete their passive immunity due to the absorbance of maternal antibodies by injected toxoid.[1]

Resistance and Immunity

Because diphtheria is principally the result of the action of the toxin formed by the organism rather than invasion by the organism, resistance to the disease depends largely on

the availability of specific neutralizing antitoxin in the bloodstream and tissues. It is generally true that diphtheria occurs only in persons who possess no antitoxin (or less than 0.01IU/mL). Assessment of immunity to diphtheria toxin for individual patients can best be made by review of documented diphtheria toxoid immunizations and primary or booster immunization if needed.[14]

Conclusion

Long time diphtheria was considered as well-controlled vaccine-preventable disease but cases of diphtheria are still occur in Ukraine, Russia and Latvia and also it is endemic in India, Bangladesh, Indonesia, Nepal, Angola and Brazil, that primarily affects unvaccinated or inadequately vaccinated individuals. Diphtheria was a major cause of childhood mortality in the pre-vaccination era but now diphtheria evolves from children's disease into disease affecting predominantly, adults. It is well recommended that high immunization coverage, prompt diagnosis and rapid identification of close contacts are principal things in control of diphtheria outbreaks.

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Case Report

Ruptured Rudimentary Horn Ectopic Pregnancy: A Case Report

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Abstract

Rudimentary horn pregnancy, a rare form of ectopic pregnancy, occurs when the embryo implants in the rudimentary horn of an unicornuate uterus. This condition presents significant diagnostic and management challenges, often leading to life-threatening complications if untreated. This case study highlights the diagnosis, clinical management, and outcomes of a patient with a rudimentary horn pregnancy.

Key Words: Rudimentary horn; ectopic pregnancy; mullerian duct malformation

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Introduction:

Mullerian duct anomalies are rare, and a unicornuate uterus with a rudimentary horn represents a small fraction of such cases. Unicornuate uterus is a type 2 classification with unilateral hypoplasia or agenesis that can be further sub-classified into communicating, non-communicating, no cavity, and no horn.[1-2] The majority (up to 92%) of rudimentary horn are non-communicating.[3] The presence of a rudimentary horn complicates pregnancy, as implantation in this region often leads to rupture due to the horn's limited distensibility. Rudimentary horn pregnancies occur in approximately 1 in 76,000 pregnancies,[3] and early diagnosis is critical due to the high risk of rupture, typically between 12 to 20 weeks gestation. Diagnosis prior to rupture occurs in as little as 14.0% of cases by ultrasonography.[4] This case report highlights the diagnosis, clinical management, and outcomes of a patient with a rudimentary horn pregnancy.

Case Presentation

A 25-year-old, G3P2(NVD) with amenorrhoea of 14 weeks was presented to the obstetrics outpatient department of Monno Medical college hospital with complains of pain abdomen for two days with gradual increased intensity, more in the lower abdomen associated with vomiting and one episode of syncopal attack. She was married for 10 years and had previous history of two vaginal deliveries. Her menstrual cycles were regular with no prior known gynecological issues. Her prenatal care was unremarkable until the sudden onset of symptoms. On admission she was in hypovoleumic shock with severe pallor, no icterus, pulse rate was 106/min, blood pressure 60/40 mm of Hg and respiratory rate was 20/min. On abdominal examination the abdomen was tense, tender and distended. Pelvic examination revealed extreme paleness of vagina and fullness in the fornixes with cervical movement tenderness. USG of lower abdomen showed empty uterine cavity and mild to moderate pelvic collection. As the patient was in shock, she was taken for immediate laparotomy after resuscitation. On opening the abdomen, the peritoneal cavity was filled with huge amount of fresh and clotted blood. There was a ruptured non communicating horn of uterus on the left side of the uterus (Figure I). A dead fetus was found in the peritoneal cavity and the cord with placenta was attached with ruptured rudimentary horn (Figure II). The right cornu of the uterus was normal in size with tube and ovary. The ruptured rudimentary horn with attached left tube was resected by placing double clamp at its base. Left ovary,

right tube & ovary left in situ. Haemostatic sutures with vicryl 1-0 were given in the resected margin of uterus. Per operatively patient was transfused with 3 units of blood and her recovery was uneventful. She was discharged on 5th post operative day in good condition.

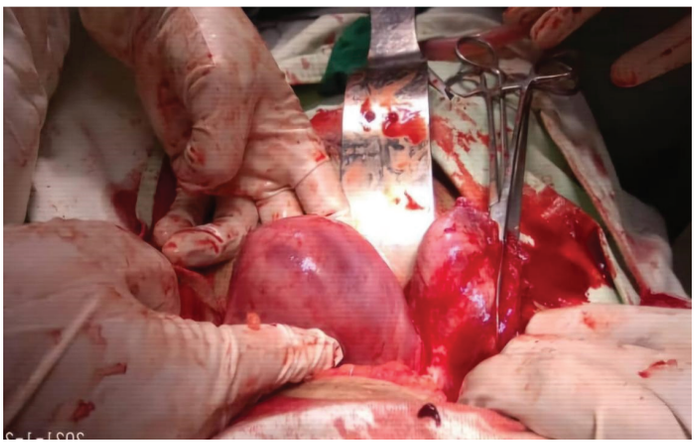

Figure I: Preoperative ruptured rudimentary horn on left side

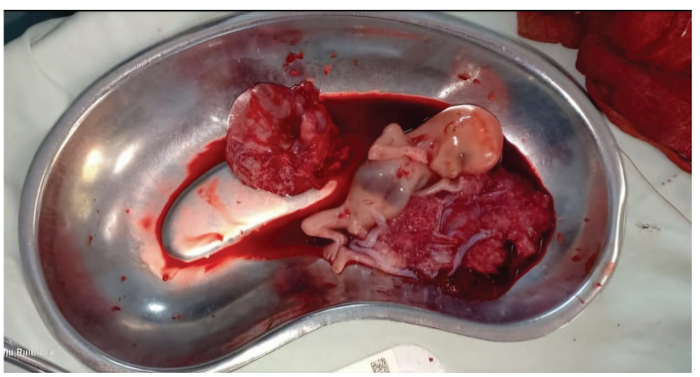

Figure II: Fetus and Placenta

Discussion

Rudimentary horn pregnancy remains a diagnostic challenge due to its rarity and the difficulty in differentiating it from normal intrauterine pregnancies, especially in early stages. The first case of uterine rupture associated with rudimentary horn was reported in 1669 by Mauriceau.[5] A careful pelvic examination in the first trimester showing deviated uterus with a palpable adnexal mass should arouse suspicion of a Mullerian anomaly.[6] Ultrasound, hysterosalpingogram, hysteroscopy, laparoscopy, and MRI are diagnostic tools.[7] Fedele et al[8] have found ultrasonography to be useful in the diagnosis. Mohsin et al[9] conducted a prospective study in 2001, which showed ultrasound examination clearly diagnostic in 96.3% patients without the help of Beta hCG in ectopic pregnancy.

Magnetic resonance imaging has proven to be a useful, noninvasive tool for the diagnosis of Mullerian abnormalities,[10] but was not feasible in this case because of acute presentation requiring early exploratory laparotomy.

Early rupture is a hallmark of rudimentary horn pregnancies, 70.0 to 90.0% rupture before 20 weeks and can be catastrophic.[11] Kadan and Romano[12] described rudimentary horn rupture as the most significant threat to pregnancy and a life-threatening situation.

Rupture leads to severe hemorrhage associated with high maternal morbidity and mortality if not promptly treated. Surgical removal of the rudimentary horn is the standard treatment, with either laparoscopic or open surgical approaches depending on the clinical situation and gestational age.

Conclusion

This case highlights the importance of early diagnosis and intervention in rudimentary horn pregnancies. Prompt surgical management is crucial to prevent rupture and its associated complications. For women with a history of Mullerian anomalies, thorough antenatal imaging can prevent delayed diagnosis of such high-risk pregnancies, leading to improved maternal outcomes.

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Perspective

Benefits of Minimal Invasive Surgery for Inguinal Hernia Repair in Bangladesh

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Abstract

Inguinal hernia is a common condition where intestinal or fatty tissue protrudes through a weak spot in the abdominal wall, often causing discomfort and restricted movement. Traditional open surgery has been the standard treatment, but minimally invasive surgery (MIS), including laparoscopic and robotic-assisted techniques, has gained popularity due to its advantages. These advanced procedures involve small incisions, specialized instruments, and a camera for precise hernia repair, leading to faster recovery, reduced pain, and lower complication risks. Laparoscopic surgery uses a camera and small tools to place a reinforcing mesh, while robotic-assisted surgery provides enhanced precision through robotic arms controlled by the surgeon. MIS results in less postoperative pain, quicker recovery, and a lower risk of infections, hematomas, and nerve damage. Additionally, it leaves minimal scarring and allows for the simultaneous repair of bilateral hernias. larger or complicated hernias. Additionally, it requires highly skilled surgeons and has higher initial costs. Despite these limitations, MIS is becoming the preferred approach for inguinal hernia repair, offering better patient outcomes and contributing to improved healthcare in Bangladesh.

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Introduction:

Inguinal hernia is a common condition that occurs when a portion of the intestine or fatty tissue protrudes through a weak spot in the abdominal wall, usually in the groin area. It affects millions worldwide and is a significant cause of discomfort, pain, and restricted physical activity. Traditional open surgery has been the standard treatment for inguinal hernia repair; however, advancements in medical technology have introduced minimally invasive surgical techniques, such as laparoscopic surgery. These techniques offer numerous benefits, including faster recovery, reduced postoperative pain, and lower risks of complications.

Inguinal hernia repair is a common surgical procedure in Bangladesh, with minimally invasive techniques such as laparoscopic. These advanced methods offer numerous benefits over traditional open surgery, including reduced postoperative pain, quicker recovery times, and lower complication rates.

Understanding Minimally Invasive Surgery

Minimally invasive surgery (MIS) for inguinal hernia repair primarily includes laparoscopic surgery and robotic-assisted surgery. Unlike traditional open surgery, which requires a large incision, MIS involves small incisions, specialized instruments, and a camera to guide the procedure.

Laparoscopic Hernia Repair: This technique involves making three to four small incisions in the abdominal wall. A thin tube with a camera (laparoscope) is inserted through one of these incisions to provide a detailed view of the internal structures. The surgeon then uses specialized instruments to place a mesh over the weakened area, reinforcing the abdominal wall and preventing the hernia from recurring.

Reduced Postoperative Pain: Since MIS involves smaller incisions, there is less trauma to muscles and surrounding tissues, leading to significantly lower pain levels after surgery. This often reduces the need for pain medications. Minimally invasive inguinal hernia repairs are associated with less postoperative discomfort compared to open surgeries. The laparoscopic approach involves smaller incisions, leading to minimal disruption of surrounding tissues and muscles. This results in decreased pain during recovery, often eliminating the need for narcotic pain relief. A study published in the Annals of Laparoscopic and Endoscopic Surgery highlights that laparoscopic repairs are linked to reduced postoperative pain and a faster return to daily activities.

Faster Recovery and Return to Activities: Patients undergoing laparoscopic hernia repair can return to daily activities much sooner than those who have open surgery. Many patients can resume light activities within a few days and strenuous activities within a few weeks. Patients undergoing minimally invasive hernia repair typically experience a quicker return to normal activities. The smaller incisions used in laparoscopic and robotic-assisted surgeries contribute to less tissue trauma, facilitating faster healing.

Lower Risk of Complications: MIS has been associated with a lower risk of complications such as infections, bleeding, and nerve damage. The smaller incisions reduce exposure to external contaminants, lowering the chances of postoperative infections. Minimally invasive techniques are associated with a reduced risk of postoperative complications. The precision of laparoscopic and robotic-assisted surgeries minimizes the likelihood of infection, hematoma, and wound-related issues.

Minimal Scarring: Due to the small incisions used in laparoscopic and robotic-assisted procedures, scarring is minimal compared to traditional open surgery, which requires a larger incision.

Lower Recurrence Rates: Studies have shown that laparoscopic repair, particularly when performed with mesh reinforcement, has lower recurrence rates compared to traditional open surgery.

Bilateral Hernia Repair in a Single Procedure: One major advantage of laparoscopic and robotic-assisted surgery is the ability to repair hernias on both sides of the groin simultaneously, which is not easily feasible with open surgery.

Availability and Success Rates in Bangladesh

In Bangladesh, minimally invasive inguinal hernia repair techniques are increasingly accessible, with several medical centers offering laparoscopic. Pristyn Care, for instance, provides laparoscopic hernia surgery with a reported 95% success rate. The growing adoption of these techniques reflects a commitment to improving patient outcomes and embracing advanced surgical methods.

Cost Considerations

The cost of minimally invasive hernia surgery in Bangladesh varies depending on the hospital and surgeon's fees. Generally, the expenses range between BDT 80,000 and BDT 2,00,000. While the initial cost may be higher than that of open surgery, the benefits of reduced postoperative pain, shorter recovery times, and lower complication rates can offset the overall expenses by decreasing the need for extended medical care and facilitating a quicker return to work.

Limitations of Minimal Invasive Surgery

While minimally invasive surgery offers numerous benefits, it may not be suitable for all patients. Certain factors should be considered:

Patient Suitability: MIS is typically recommended for patients with recurrent or bilateral hernias, whereas open surgery may still be preferred for individuals with larger or complicated hernias.

Higher Initial Costs: Minimally invasive procedures may have a higher upfront cost due to the specialized equipment and expertise required. However, the reduced need for prolonged hospital stays and quicker recovery may offset the cost over time.

Surgeon Expertise: Not all surgeons are trained in advanced laparoscopic hernia repair. Patients should seek experienced surgeons specializing in MIS to ensure optimal outcomes.

Conclusion

Minimally invasive surgery has become a preferred method for inguinal hernia repair due to its numerous advantages, including reduced pain, faster recovery, lower risk of complications, and minimal scarring. As medical technology continues to advance, the accessibility and effectiveness of these techniques will further improve,

providing patients with better treatment options and outcomes. However, careful patient selection and the expertise of the surgeon remain crucial factors in ensuring a successful surgery. Minimally invasive surgery for inguinal hernia repair offers significant benefits, including reduced postoperative pain, faster recovery, lower complication rates, and enhanced surgical precision. In Bangladesh, the increasing availability of these advanced techniques provides patients with effective and efficient treatment options, contributing to improved healthcare outcomes.

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Information for Author(s)

A. Manuscript submission

Authors must submit electronic version in MS Word and two hard copies of the manuscript with a 'Cover letter' with sequences and contributions as well as signatures of all authors (a sample is given below) to the Editor-in-Chief via e-mail (jmomc2015@gmail.com, jmomc@monnomch.edu.bd) or surface mail or by hand to the address on right:

Editor-in-Chief
Journal of Monno Medical College
Office of the Principal
Monno Medical College
Monno City, Gilondo
Manikganj-1800, BANGLADESH

To
The Editor-in-Chief
Journal of Monno Medical College (JMoMC)
Monno City, Gilondo, Manikganj-1800, BANGLADESH

Subject: **Submission of manuscript** for Original Article (OA)/Brief Communication (BC)/ Letter to Editor (LE) / Case Report (CR)/ Review Article (RA)/ Others

Dear Sir,
I/we the following author(s) am/are submitting a soft copy in MS word and 2 hard copies of my/our manuscript for OA /BC /LE /CR /RA /Other with the tile: ----------
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for publication in the upcoming issue of JMoMC.

I/we ensure that the manuscript has NOT been published in or has been accepted or has been submitted for publication in any other medical/dental journal at home and abroad.

I/we ensure that the manuscript has been seen and approved by all authors and bear responsibility for all pieces of information included in the manuscript and am/are ready to handle any legal issues entailed thereof.

I/we also ensure that following are the authors with their sequences by authorship criteria for the study/manuscript, endorsed by signatures of all authors and none of the individuals fulfilling authorship criteria has been omitted.

Sequ - ence	Author Name	Author signature against contribution of authorship criteria			
		(1)	(2)	(3)	(4)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					

Authorship criteria:

(1) Substantial contributions to conception or design of the work, or acquisition, analysis or interpretation of data for the work; AND
(2) Drafting the work or revising it critically for important intellectual content; AND
(3) Final approval of the version to be published; AND
(4) Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

B. Manuscript preparation for JMoMC

B.1. For manuscript preparation, the Journal of Monno Medical College (JMoMC) encourages authors to follow recommendations by the International Committee for Medical Journal Editors (ICMJE) (https://www.icmje.org/recommendations/).

B.2. Brief guidelines of manuscript preparation for JMoMC:

B.2.1. For Original Research articles- - Limit within 4,500 words including up to 40 references, up to 6 tables and figures, notes and titles- that corresponds to a maximum of 5 printed pages of the JMoMC. Divide the text into IMRAD (Introduction, Methods, Results and Discussion). However, authors can also add subheadings within these sections to further organize the contents.

Following are general formats of manuscript sections for all study designs and manuscript formats.

i. **Title page-** Includes the article title, author information (full names of all authors with study-time affiliations), any disclaimers, source of support, word count and number of tables and figures.
   Article title- Provides a clear description of the total article with no more than 40 characters including letters and spaces. The title should include key words that will make electronic retrieval of the article sensitive and specific.
   Author information- Include full names of the authors with name of the department(s) and institution(s) or organization(s) where the work has been completed (to be attributed).
   Provide full contact information, including land/surface mail, e-mail address and telephone number of the corresponding author.
   Disclaimers- Include a statement that views expressed in the submitted article are his/her/their own and not an official position of the institution or funder.
   Source(s) of support- Include grants, equipment, drugs and/or other support that facilitated completion of the work and/or writing the manuscript.
   Word count- Provide word counts for abstract and the text excluding acknowledgements, tables, figure legends and references.
   Number of tables and figures- Provide to ensure that all tables and figures are actually included with the manuscript.
ii. ***Abstract-*** The JMoMC requires 'structured abstract' within 250 words for manuscripts of Original research, Systematic reviews and Meta-analyses providing Background, Objectives, Methodology, Results and Conclusion of the study. Ensure that the abstract accurately reflect the content of the article and be careful that information in the abstract do not differ from that in the text.
iii. ***Introduction-*** Provide a context or background for the study mentioning the nature of the problem (research question) and its significance. Cite only strictly pertinent references and do not include data or conclusions from the work being reported. Take care that all key words of the title have been elaborated from recent previous works and no important work has been omitted. State specific purpose or research objective of, or hypothesis tested by the study or observation.
iv. ***Methods-***The JMoMC names this section as 'Methodology' and includes clarity about why and how the study was done with sufficient details to facilitate reproducibility. Give details about any funding that helped to conduct the research. Should include a statement that the research was approved by an independent local or national review body (i.e., Ethics committee or Institutional review board). Describe statistical methods with enough detail to enable knowledgeable reader to judge and verify reported results.
v. ***Results-*** Present results in logical sequence in the text, tables and figures, giving the most important findings first. Do NOT repeat all the data in the table or figures in the text- emphasize or summarize only the important observations. Provide data on all primary and secondary outcomes identified in the Methods section. Give numeric results not only

as 'derivatives' (e.g., percentages) but also as 'absolute' numbers from which the derivatives were calculated. Restrict tables and figures to those required to explain the argument. Use graphs as an alternative to tables with many entries- do NOT duplicate data in tables and graphs. Avoid non-technical use o f technical terms in statistics (e.g., 'random', 'normal', 'significant', 'sample' etc). Separate reporting of data by demographic variables like age, sex etc.

vi. ***Discussion-*** Begin by briefly summarizing main findings and explore possible mechanisms or explanations for these findings. Emphasize new and important aspects of the study. State limitations of the study and explore implications for the findings of the study for future research and for clinical practice or policy. Discuss influence or association of variables on the findings and limitations of the data. Do NOT repeat in detail the data or other information given in other parts of the manuscript. Link conclusions with goals of the study, but avoid unqualified statements and conclusions not adequately supported by the data. Avoid claiming priority or alluding to work that has not been completed. State new hypothesis when warranted, but label them clearly.

vii. ***References-*** Provide direct references to original research sources whenever possible. Designate references to papers accepted but not yet published as 'in press' or 'forthcoming'. Avoid citing a 'personal communication' unless it is essential, in which case mention name of the person and date of communication in parenthesis in the text. Accuracy of all reference citations are not checked by editors- authors are responsible for checking that none of the references cite retracted articles. Number references consecutively in the order in which they are first mentioned in the text. Identify references in texts, tables and legends by Arabic numerals in parenthesis (do NOT superscript them). Abbreviate titles of the journals according to the style used for MEDLINE (www.ncbi.nlm.nih.gov/nlmcatalog/journals).
Style and format- Follow NLM style (previous Vancouver style) with examples in webpage (www.nlm.nih.gov/bsd/uniform_requirements.html) or detailed in NLM's Citing Medicine, 2nd edition (www.ncbi.nlm.nih.gov/books/NBK7256/).

viii. ***Tables-*** Prepare tables according to standard requirements. Include tables after 'Reference' section to supplement and not to duplicate the text in 'Methodology' or 'Results' sections. Number tables consecutively in the order of their first citation in text and provide a title for each. Title of the table should be short but self-explanatory, containing information that allows readers to understand the table's content without going back to the text. Be sure that each table is cited in the text. Give each column a short or an abbreviated heading. Place explanatory matter in footnotes, not in the heading. Explain all non-standard abbreviations in footnotes and use symbols to explain information, if needed. For using data from another published or unpublished source, obtain permission and acknowledge that source fully.

ix. ***Illustrations (Figures)-*** Should be either professionally drawn and photographed or submitted as photographic quality digital prints. For Radiological and other clinical/ diagnostic images as well as pictures of pathology specimens or photomicrographs, send high-resolution photographic image files. Figures should be made as self-explanatory as possible. Ensure titles and detailed explanations belong in the legends- not on the illustrations (figures) themselves. Number figures consecutively in the order as they been cited in the text. If a figure has been published previously, acknowledge the original source and submit written permission from the copyright holder to reproduce it. In the manuscript, legends for illustrations should be on a separate page, with Arabic numerals corresponding to illustrations.

x. ***Units of measurement-*** Measurements of length, height, weight and volume should be in metric units (meter, kilogram or litre) or their decimal multiples. Temperatures should be in Celsius. Blood pressures should be in millimeters of Mercury.

xi. ***Abbreviations and symbols-*** Use only standard abbreviations. Avoid abbreviations in the 'Title' of the manuscript. The spelled-out abbreviation followed by the abbreviation in parenthesis should be used on first mention, unless the abbreviation is a standard unit of measurement.

B.2.2. For Case Reports- Limit within 2,500 words including up to 30 references and up to 4 tables and figures- corresponding a maximum of 3 printed pages of the JMoMC. Divide text into an abstract, an introduction, the case presentation, discussion and conclusion. For using identifiable pictures of patients, provide patient's informed consent for this publication, which includes his/her awareness of possible consequences after publication.

B.2.3. For Reviews- Limit within 6,000 words including up to 110 references and up to 6 tables and figures. Divide text into an abstract, an introduction that outlines the main themes, brief subheadings and/or an outline of important unresolved questions.

B.2.4. For Letters to Editor- Limit within 1,000 words including up to 5 references and up to 2 tables and figures- that corresponds to 1 printed page of the JMoMC.

C. Manuscripts management for JMoMC

C.1. Manuscript receive and management: Manuscripts are received throughout the year and a submitted manuscript is usually published and posted to the author within a highest of 9-months of submission. However, this timeline may be prolonged in cases of: (a) bad submission time (3-months before publication dateline, unless requested); (b) bad preparation (not followed appropriately the JMoMC requirements), (c) bad responses (failing to respond within set timeline and response is inadequate).

C.2. Stages and timelines of Management

C.2.1. Stage 1: Editorial Scanning (usually completed in 1st month of submission)

a. Received papers are entered into receive register giving an ID and acknowledged;
b. Editorial scanning- checked for appropriateness, integrity and plagiarism;
c. Primary author response- sent to corresponding author for primary response.

C.2.2. Stage 2: Peer Review (usually completed in 2nd month of submission)

a. Processed for Peer reviews (select Peer(s), sent to reviewers with timeline);
b. Sent to corresponding author for responses with a timeline;
c. Cross-check by Editorial staff for accommodation of the review comments.

C.2.3. Stage 3: Decision of Acceptance/ Rejection (usually completed within 3rd month of submission)

a. Information of 'Acceptance'/ 'Rejection' communicated with the corresponding author;
b. Accepted papers are processed for Pre-Press version and submitted to Printing Press;
c. Decisions of rejections of the submissions are made in cases of serious violation of publication ethics including plagiarism, allegations of misconduct pre- and post-publication, authorship dispute, undisclosed conflict(s) of interest, research misconduct (fabricated study and data falsification), unethical practice during research, and duplicate publication.

(2) ***Stage 4:*** Publication (usually within 6th month of submission)

a. Printed hard copies are distributed soon after publication (in no cost currently) to the faculty members of MoMC, Libraries of the BMDC-registered Medical/ Dental institutions in Bangladesh and the authors of the publications;

b. ***Usually 3***-copies of the published issue are sent for the authors of a publication to the address of communi cation of the corresponding author.