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EDITORIAL

Knowledge, Attitude, and Preventive Practices (KAP) Regarding Dengue Among Urban Residents in Bangladesh

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ABSTRACT: Dengue fever remains a significant health threat in urban Bangladesh, exacerbated by rapid urbanization, poor waste management, and inadequate mosquito control. Knowledge, attitudes, and preventive practices (KAP) play a crucial role in combating this disease. While most urban residents are aware of dengue's symptoms, many lack proper understanding of its transmission, particularly its breeding sites. Attitudes towards prevention often reflect a sense of low personal risk and a lack of trust in government measures, leading to complacency. Despite knowledge of preventive measures like eliminating stagnant water and using mosquito nets, implementation is inconsistent. Socio-demographic factors such as education and income significantly influence KAP. Effective dengue control requires improved public education, community involvement, better access to preventive resources, and stronger waste management. Strengthening the healthcare system's capacity to handle outbreaks is also essential for mitigating dengue's impact in urban areas.

Keywords: Dengue, Knowledge, Attitude, Preventive Practices, Urban Bangladesh.

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INTRODUCTION

Dengue fever, a viral disease transmitted by Aedes aegypti mosquitoes, continues to be a major public health challenge in tropical and subtropical regions.[1] Bangladesh, with its rapidly growing urban populations, inadequate waste management systems, and tropical climate, has become one of the countries with recurrent dengue outbreaks. While there has been increasing awareness about the disease, much of the response relies on the population's knowledge, attitudes, and preventive practices (KAP). The ability of the population to effectively manage and mitigate dengue outbreaks largely depends on these three factors. This editorial explores the existing KAP regarding dengue among urban residents in Bangladesh and offers recommendations for improving dengue prevention.

Understanding the Knowledge of Dengue Among Urban Residents

Knowledge is the first line of defense against any public health threat. In the case of dengue fever, understanding its transmission, symptoms, and prevention measures is essential for reducing the incidence of the disease. Several studies have explored the level of knowledge about dengue among the urban residents of Bangladesh, revealing both strengths and significant gaps. A survey conducted in Dhaka city found that while most urban residents were familiar with the basic symptoms of dengue, such as fever, pain behind the eyes, and rash, many were misinformed about its transmission mechanisms.[2] For example, many believed that dengue mosquitoes breed in dirty water, which is a misconception since Aedes aegypti mosquitoes prefer clean, stagnant water. This lack of clarity on breeding sites leads to ineffective measures to control mosquito populations, as many residents focus their efforts on areas with visible waste rather than common breeding grounds such as flower pots, old tires, and uncovered water tanks.[3]

Furthermore, a significant portion of the population still does not associate dengue with the larger environmental issues such as urbanization, improper waste disposal, and climate change. These factors contribute to the favorable breeding conditions for Aedes mosquitoes. According to a study by Tan *et al.*, only 20% of the respondents understood the link between environmental factors

and the spread of dengue.[4] Consequently, a lack of comprehensive knowledge reduces the effectiveness of individual and community efforts to control dengue fever. In contrast, educated urban residents, particularly those with formal schooling or access to healthcare information, tend to exhibit a higher level of awareness about dengue. The same study revealed that individuals with higher education levels were more likely to correctly identify mosquito breeding sites and understand the need for preventive measures, such as eliminating stagnant water and using mosquito repellents.[5]

Attitudes Towards Dengue Prevention and Control

The attitude of urban residents plays a significant role in determining how knowledge is transformed into preventive actions. In Bangladesh, attitudes toward dengue prevention are shaped by a variety of factors, including personal experience with the disease, trust in health authorities, and socio-economic conditions. While a large proportion of urban residents express concern about the potential dangers of dengue, many do not perceive themselves as personally at risk. A study conducted in Dhaka city by Hossain *et al*., found that although over 70% of the respondents considered dengue a serious disease, only 40% believed they were likely to contract it.[6] This sense of invulnerability is a common barrier to the adoption of preventive practices. Residents may acknowledge the threat posed by the disease but fail to take appropriate actions because they believe the disease is unlikely to affect them personally. Trust in the local authorities' efforts to control dengue is another significant factor shaping attitudes toward preventive practices. Many residents in urban areas, particularly in slums and low-income neighborhoods, have expressed dissatisfaction with the government's dengue control efforts. According to the study by Rahman *et al*., respondents who felt that the authorities were not adequately addressing the mosquito population or providing sufficient public health campaigns were less likely to engage in personal preventive measures, such as using insecticide-treated nets or eliminating breeding sites around their homes.[7] This lack of trust in public health initiatives can lead to a sense of helplessness and a reluctance to take preventive actions. On the other hand, some studies show that a positive relationship between individual attitudes and community-based interventions can lead to better preventive outcomes. Residents who actively participated in local dengue prevention programs, such as cleaning community spaces and educating neighbors, showed more proactive attitudes towards disease control.[8] Therefore, fostering a collective sense of responsibility within communities could be an effective way to improve attitudes toward dengue prevention.

Preventive Practices in Urban Bangladesh

Preventive practices are essential to controlling dengue, and urban residents must be proactive in taking measures to reduce mosquito exposure and eliminate breeding grounds. In Bangladesh, while many individuals are aware of the recommended preventive measures, such as using mosquito nets, applying insect repellents, and eliminating stagnant water, the actual implementation of these practices is often insufficient. A survey by Romanello *et al*., found that while 85% of urban residents reported being aware of the need to eliminate mosquito breeding sites around their homes, only 45% regularly took action to do so.[9] Common practices to reduce mosquito populations include removing old containers, covering water storage tanks, and regularly cleaning gutters. However, a significant number of households failed to implement these actions consistently, citing a lack of time, resources, or motivation. Moreover, in many densely populated urban areas, there is simply not enough space for everyone to engage in effective mosquito control, making it more challenging to eliminate breeding sites. Another common preventive practice is the use of mosquito nets, which is particularly important during peak mosquito activity times, such as dawn and dusk. However, a survey conducted by Nguyen *et al*., found that only 25% of urban households in Dhaka regularly used mosquito nets.[10] While this is a common recommendation from health authorities, it is often not followed due to cost constraints and a lack of awareness about their effectiveness in preventing mosquito bites. Some urban residents also opt for other methods, such as using electric insect repellents, though these are less cost-effective and have limited reach in large populations.[11] In addition to individual practices, urban communities must address larger environmental issues, such as inadequate waste management and the improper disposal of plastic containers and other waste materials, which provide ideal breeding grounds for mosquitoes. Urban areas with inefficient waste disposal systems are at a higher risk of dengue outbreaks due to the abundance of

stagnant water in discarded containers. However, this is a systemic problem that requires coordinated efforts from both the government and communities to address.

Socio-Demographic Factors Influencing KAP

Socio-demographic factors such as age, gender, education level, and income significantly influence the KAP regarding dengue among urban residents in Bangladesh. Studies have shown that women, especially mothers and caregivers, tend to exhibit more favorable knowledge and attitudes towards dengue prevention. This could be due to their role in maintaining household cleanliness and caring for family members, which increases their awareness of the disease and its risks.[12] Age also plays a role in KAP, with younger individuals more likely to be aware of dengue and its prevention. This is partly because younger generations are more exposed to media and public health campaigns through digital platforms, such as social media, compared to older generations who may not be as tech-savvy. As a result, younger urban residents tend to have more up-to-date knowledge of the disease and are more likely to adopt preventive behaviors.[13] Income and education are also closely related to KAP. Residents with higher education levels and higher incomes are more likely to possess accurate knowledge about dengue and adopt preventive practices. This group is more likely to have access to preventive resources, such as mosquito nets and insecticides, and may be more engaged in community-based interventions.[14] In contrast, individuals with lower income levels may lack the financial resources to purchase mosquito control products and may not have access to information about the disease.

Challenges in Controlling Dengue in Urban Bangladesh

Despite the growing awareness about dengue fever, controlling its spread in urban areas remains a daunting challenge. Rapid urbanization, inadequate infrastructure, poor waste management, and climate change all contribute to the increased risk of dengue outbreaks in cities like Dhaka. Urban environments in Bangladesh, particularly informal settlements and slums, are often overcrowded, with limited access to basic sanitation facilities. This makes it difficult for residents to maintain cleanliness and eliminate mosquito breeding sites. Additionally, the city's poor waste disposal system further exacerbates the problem, as discarded containers and stagnant water provide ideal breeding grounds for Aedes mosquitoes. Furthermore, the healthcare system in Bangladesh is often overwhelmed during dengue outbreaks, with hospitals and clinics unable to handle the surge in patients. This leads to delays in diagnosis and treatment, contributing to the high mortality rate in severe cases of dengue. Lack of coordination between public health authorities and healthcare providers also hampers the effectiveness of response measures.

Recommendations for Improving KAP Regarding Dengue in Urban Bangladesh

To effectively reduce the impact of dengue fever in urban Bangladesh, improving the Knowledge, Attitude, and Preventive Practices (KAP) of residents is crucial. Public education campaigns should utilize diverse communication channels, such as television, social media, and community outreach, ensuring clear and accessible information for all. Engaging communities in identifying and eliminating mosquito breeding sites enhances the adoption of preventive measures. Access to affordable resources like insecticides and mosquito nets should be improved, especially in low-income areas, through collaborations with NGOs and local businesses. Strengthening waste management systems and bolstering healthcare capacity to handle outbreaks are essential to controlling dengue's spread.

CONCLUSION

Dengue fever continues to pose a serious public health threat in urban areas of Bangladesh. While urban residents possess a general understanding of the disease, knowledge gaps, ineffective preventive practices, and socio-demographic factors contribute to the persistence of dengue outbreaks. Addressing these challenges requires a comprehensive approach that includes education, community engagement, improved access to resources, and better infrastructure. By enhancing KAP and adopting more effective control measures, Bangladesh can mitigate the impact of dengue and safeguard the health of its urban populations.

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Impact of Screen Time on Preschool Development: A Cross-Sectional Study in Netrokona, Bangladesh

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ABSTRACT: ***Background:*** The growing prevalence of screen time among young children raises concerns regarding its potential effects on early childhood development, particularly in terms of cognitive, social, and behavioral functioning. ***Objective:*** This study aimed to evaluate screen time patterns in preschool children and assess their perceived effects on development from the perspective of caregivers. ***Methods:*** A cross-sectional study was conducted among 126 caregiver-child dyads in Netrokona, Bangladesh. Data was collected via structured questionnaires, covering demographic details, screen usage patterns, and caregivers' observations of developmental behaviors. Descriptive and inferential statistical analysis, including p-values and standard deviations, was used to assess relationships between variables. Pearson's correlation and t-tests were applied to examine associations between screen time duration and development variables. ***Results:*** Among the 126 children, 113 (89.7%) were screen users, with a mean age of 4.1 ± 0.6 years. The daily screen time was 2.7 hours (SD = 1.5). Notably, 36 children (28.6%) had 1–2 hours of screen time, and 13 children (10.3%) used screens for over 4 hours. Significant correlations were found between increased screen time and developmental concerns such as restlessness ($r = 0.32$, $p = 0.014$) and difficulty concentrating ($r = 0.29$, $p = 0.022$). Moreover, 42 children (33.3%) showed restlessness when screen time was reduced, and 25 children (19.8%) had trouble focusing on non-screen tasks. Only 35 caregivers (27.8%) were aware of recommended screen time limits for children. ***Conclusion:*** The study highlights significant developmental concerns linked to prolonged screen exposure. Increased awareness and education on screen time guidelines are essential for improving preschool developmental outcomes.

Keywords: Screen Time, Preschool Development, Caregiver Awareness, Child Behavior, Developmental Impact.

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INTRODUCTION

In recent years, the impact of screen time on preschool-aged children's development has garnered considerable attention from both researchers and policymakers.[1] Screen exposure, particularly to digital media, has become an inherent part of young children's daily lives, which has resulted in increased concerns regarding its effects on various developmental domains, including cognitive, language, social, and motor development. The rapid proliferation of smartphones, tablets, computers, and television in households has made it difficult for parents and caregivers to control the duration and quality of screen time. As digital devices become more prevalent, it is crucial to examine the impact of screen time on early childhood development to better understand its potential consequences and guide future educational practices, policy formulation, and health interventions. The early childhood years represent a crucial period in human development, as this is when the brain undergoes rapid development, particularly in areas related to language acquisition, cognitive skills, emotional regulation, and social interactions. Research has consistently demonstrated that early experiences shape the neural architecture of the brain, influencing lifelong learning, behavior, and health. Digital media consumption in early childhood, especially in excess, has been associated with various developmental concerns, including delayed language skills, impaired attention, and problematic social behaviors.[2] Despite widespread recommendations from health authorities like the American Academy of Pediatrics (AAP) and the World Health Organization (WHO) to limit screen time for children under five, adherence to these guidelines is often inconsistent, leading to concerns about the growing screen exposure in younger populations. The AAP recommends no screen time for children under 18 months, except for video

chatting, and no more than one hour per day for children aged 2 to 5 years. These guidelines emphasize that screen time should involve high-quality content that is age-appropriate and should be supervised to ensure that children are engaging with it in a meaningful way. However, despite these recommendations, global surveys and studies indicate that a significant portion of children exceed these recommendations, particularly in urban settings where access to digital devices is more widespread .[3] In Bangladesh, where the rapid growth of mobile phone usage and internet access is evident, screen time habits among young children remain an underexplored area in research.

Understanding the relationship between screen time and developmental outcomes in young children is critical, particularly in low and middle-income countries like Bangladesh, where limited research exists on the topic. Studies conducted in developed countries suggest that excessive screen time is associated with various negative outcomes, such as obesity, language delays, attention problems, and even issues with sleep regulation.[4] However, these findings may not fully apply to settings where children have different lifestyles, socio-economic conditions, and educational systems. This research thus aims to fill this gap by investigating the screen time habits of preschool children in Netrokona, a district in Bangladesh, and evaluating caregivers' perceptions of how screen use influences children's cognitive, social, and behavioral development. In recent years, there has been a growing body of literature investigating the effects of screen time on child development, focusing primarily on developed countries. A study by Westby *et al.,* found that increased screen time was significantly associated with lower scores on developmental screening tests, particularly in the areas of language development and executive function.[5] Furthermore, research by Oakes *et al.,* suggests that early exposure to screen time can negatively affect the development of essential skills like attention and memory, which are crucial for school readiness.[6] These studies emphasize the need for greater awareness of the potential consequences of excessive screen exposure and advocate for the implementation of effective interventions to reduce screen time in early childhood. While these findings are compelling, the implications of screen time for child development in non-Western, low-resource settings like Bangladesh remain unclear. In Bangladesh, where many children grow up in households with limited access to educational resources but widespread exposure to screens through mobile phones and television, understanding the impact of screen time on preschool development is critical. Limited research on this topic in Bangladesh has focused primarily on adult populations, leaving a gap in understanding how early exposure to screens might affect children's development in a cultural and socio-economic context that differs significantly from Western societies.

This study aims to bridge this gap by conducting a cross-sectional study in Netrokona, Bangladesh, to investigate preschool children's screen time habits and assess the developmental outcomes associated with these habits. By focusing on preschool-aged children aged 3 to 5 years, this study seeks to contribute to the growing body of research that examines how screen time influences early childhood development, particularly in developing countries. This research also aims to assess caregiver perceptions of screen time, as caregivers play a crucial role in mediating children's exposure to screens and are instrumental in shaping the development of children's screen habits. In addition to examining the frequency and duration of screen time, this study will explore the type of content children are exposed to, including educational versus non-educational content, and the context in which screens are used. Previous studies have found that the context in which children interact with screens—such as whether they are supervised, whether screens are used as a reward, or whether they are used during meals—can influence the developmental outcomes associated with screen exposure. For instance, Galetzka *et al*., found that when screen time is used to calm children or as a reward, it can negatively affect parent-child interactions and limit opportunities for children to engage in active play.[7] This study will also investigate the developmental domains that may be influenced by screen time, including language development, social interaction, attention, and behavior. Caregivers will be asked to report on their children's ability to follow instructions, engage in verbal communication, and participate in social interactions, as well as any signs of restlessness or difficulty concentrating when screen time is limited. These factors are critical indicators of healthy developmental progress and will help to provide a clearer understanding of the specific developmental areas that may be most affected by excessive screen exposure. Ultimately, the goal of this study is to provide evidence-based recommendations for policymakers and healthcare providers in Bangladesh, offering guidelines on how to manage screen time in a way that supports healthy development in young children. By increasing awareness of the developmental risks associated with excessive screen exposure, particularly in low-resource settings, this study aims to contribute to the global conversation on the importance of responsible screen time practices in early childhood.

Aims and Objective

The aim of this study is to investigate the impact of screen time on preschool children's development in Netrokona, Bangladesh. Specifically, the study will explore screen usage patterns, assess developmental outcomes across cognitive, social, and behavioral domains, and evaluate caregiver perceptions of how screen time influences early childhood development.

MATERIAL AND METHODS

Study Design

This study employed a descriptive cross-sectional design to investigate the impact of screen time on preschool children's development in Netrokona, Bangladesh. Data were collected from 126 caregiver-child days using convenience sampling. The study aimed to explore screen time habits and developmental outcomes, focusing on

cognitive, social, and behavioral domains. It was conducted over three months, with data being gathered via structured questionnaires filled out through face-to-face interviews. The study aimed to provide an in-depth understanding of how screen exposure correlates with children's developmental progress.

Inclusion Criteria

Children aged 3 to 5 years from Netrokona, Bangladesh, were included in the study. Participants had to be healthy, without any known developmental disabilities or chronic illnesses. Additionally, children whose primary caregivers were available to provide informed consent were eligible for inclusion. Both urban and rural populations were considered to account for any regional differences in screen usage patterns.

Exclusion Criteria

Children with diagnosed developmental disabilities, neurological disorders, or chronic illnesses were excluded from the study, as these conditions could confound the results. Children with a history of severe medical conditions that could affect their cognitive, motor, or social development were also excluded. Additionally, children whose caregivers did not consent to participate or did not meet the inclusion criteria were excluded from the study.

Data Collection

Data were collected through structured questionnaires administered via face-to-face interviews with the primary caregivers of participating children. The questionnaires included sections on demographics, screen usage patterns, caregiver-reported developmental observations, and the types of content children were exposed to. Information on screen time duration, context, and content was gathered. The data collection process was completed over a period of three months, ensuring that a representative sample of children was surveyed.

Data Analysis

The collected data were entered and analyzed using SPSS version 26.0. Descriptive statistics, including frequency distributions, means, and standard deviations, were used to summarize the data. Inferential statistics, such as chi-square tests and Pearson's correlation coefficients, were applied to identify associations between screen time and developmental outcomes. A p-value of less than 0.05 was considered statistically significant.

Procedure

The study began with obtaining ethical approval from the relevant institutional review board. Caregivers were provided with detailed information about the study, including its purpose and procedures. After obtaining verbally informed consent, participants were asked to complete the structured questionnaires. Caregivers provided demographic details, their child's screen time habits, and observed developmental behaviors, including language skills, social interaction, and attention span. Screen time was categorized by device type (smartphone, television, etc.) and duration, with specific questions about context (mealtime, bedtime, etc.). Data collected in both urban and rural areas of Netrokona to assess regional differences. Following data collection, responses were coded, cleaned, and analyzed for consistency. Statistical tests were conducted to explore correlations between screen time and developmental variables. The study ensured that data was anonymized and confidential. Participants' rights were respected throughout the process, ensuring their well-being and privacy.

Ethical Considerations

The study was approved by the Institutional Review Board (IRB) of the relevant institution. Informed consent was obtained from all caregivers, ensuring they were fully aware of the study's purpose and procedures. Participants were assured of confidentiality, and their data were anonymized.

RESULTS

The majority of children were between the ages of 4 to 5 years (61.1%), with 64 male and 62 female children, representing a balanced gender distribution. Urban participants accounted for 61.9% of the sample, while 38.1% were from rural areas. The age and gender distribution in the sample were well balanced, ensuring that both urban and rural settings were appropriately represented in the study.

Table 1: Demographic Characteristics

Variable	Frequency	Percentage (%)
Age Group		
3–4 Years	49	38.9%
4–5 Years	77	61.1%
Gender		
Male	64	50.8%
Female	62	49.2%
Residential Area		
Urban	78	61.9%
Rural	48	38.1%
Total	126	100%

The demographic breakdown shows that the study sample was diverse in terms of age, gender, and residential location. Nearly 62% of the children were from urban areas, with the rest from rural settings. Both male and female children were almost equally represented, and the age distribution was relatively even.

Screen Use Patterns

The results revealed that a significant proportion of children (89.7%) were screen users. Among the 113 screen users, smartphones were the most commonly used device (80.3%), followed by television (49.2%). Notably, 36 children began using screens before the age of one, indicating early exposure to digital media. The data analysis also showed variations in the type of content consumed, with a majority watching cartoons (83.3%), followed by educational content (31.7%).

Table 2: Screen Use Patterns

Variable	Frequency	Percentage (%)
Screen Usage		
Screen Users	113	89.7%
Non-Screen Users	13	10.3%
Device Type		
Smartphone	101	80.3%
Television	62	49.2%
Tablet	6	4.8%
Computer	6	4.8%
Early Exposure		
Before 1 Year	36	28.6%
1–2 Years	39	30.9%
Total	126	100%

A large proportion of children (89.7%) were exposed to screens. Smartphone use is dominated, with 80.3% of children using them, followed by television. Early screen exposure was evident, with nearly 29% of children starting before one year of age. These results underscore the prevalence of screen exposure in early childhood.

Duration and Context of Screen Use

The data indicated significant variations in the daily screen time of children. While 36 children (28.6%) had screen time of 1–2 hours, 13 children (10.3%) exceeded 4 hours of screen use daily. The context of screen use showed that 63 children (50%) used screens when caregivers were busy, and 80 children (63.5%) engaged with screens during meals.

Table 3: Duration and Context of Screen Use

Variable	Frequency	Percentage (%)
Daily Screen Time		
30–60 minutes	29	23.0%
1–2 hours	36	28.6%
2–4 hours	27	21.4%
More than 4 hours	13	10.3%
Context of Use		
During Meals	80	63.5%
Before Bedtime	30	23.8%
When Caregivers Busy	63	50.0%
As Reward/Calming Tool	48	38.1%
Total	126	100%

A substantial portion of children exceeded the recommended screen time, with 10.3% using screens for more than four hours daily. The context of use revealed that a significant number of children were exposed to screens during meals (63.5%) and when caregivers were occupied (50%).

Content Type and Supervision

The analysis of content types revealed that most children (83.3%) watched cartoons, followed by educational content (31.7%). Supervision practices varied, with 56 caregivers (44.4%) always supervising their child's screen time. However, a considerable portion (22%) of children were supervised only sometimes or rarely.

Table 4: Content Type and Supervision

Variable	Frequency	Percentage (%)
Content Type		
Cartoons	105	83.3%
Educational Content	40	31.7%
Music	30	23.8%
Games	20	15.9%
Supervision		
Always Supervised	56	44.4%
Often Supervised	27	21.4%
Sometimes Supervised	22	17.5%
Rarely Supervised	8	6.3%
Total	126	100%

Cartoons were the most common content type (83.3%), followed by educational material (31.7%). While 44.4% of caregivers always supervised their children's screen use, a significant proportion (23.8%) reported less frequent supervision, highlighting potential gaps in oversight.

Developmental Observations by Caregivers

Caregivers reported that 81 children (64.3%) could always follow instructions, and 80 children (63.5%) communicated verbally. Social interaction was consistently observed in 85 children (67.5%). However, restlessness when limiting screen time was reported by 42 children (33.3%).

Table 5: Developmental Observations by Caregivers

Variable	Frequency	Percentage (%)
Following Instructions		
Always	81	64.3%
Often	27	21.4%
Sometimes	15	11.9%
Rarely	2	1.6%
Verbal Communication		
Always	80	63.5%
Often	20	15.9%
Sometimes	19	15.1%
Rarely	4	3.2%
Social Interaction		
Always	85	67.5%
Often	24	19.0%
Sometimes	13	10.3%
Restlessness		
Always	12	9.5%
Often	21	16.7%
Sometimes	42	33.3%
Total	126	100%

Developmental observations by caregivers showed strong verbal communication and social interaction, with 64.3% and 67.5% of children demonstrating consistent skills in these areas. However, nearly one-third of children exhibited restlessness when their screen time was limited.

Caregiver Perceptions and Awareness

Results revealed that 72 caregivers (57.1%) believed screen time negatively impacted development, while only 28 caregivers (22.2%) adhered to the recommended screen time guidelines.

Table 6: Caregiver Perceptions and Awareness

Variable	Frequency	Percentage (%)
Perception of Screen Time		
Affects Development	72	57.1%
Does Not Affect	20	15.9%
Unsure	21	16.7%
Awareness of Guidelines		

Aware of Guidelines	35	27.8%
Adhere to Guidelines	28	22.2%
Total	126	100%

While 57.1% of caregivers were concerned about the developmental impact of screen time, only 27.8% were aware of the recommended guidelines, indicating a significant gap in caregiver education.

Concentration and Restlessness

The results indicated that concentration issues were prevalent in 25 children (19.8%). Similarly, restlessness was reported in 42 children (33.3%) when screen time was limited.

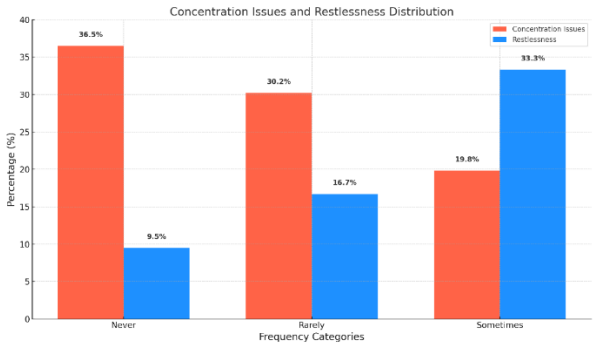

Figure 1: Concentration and Restlessness

Concentration issues and restlessness were common, with a significant proportion of children (19.8%) showing difficulties with concentration and a third of children (33.3%) becoming restless when screen time was reduced.

Sleep Disturbance

Results on sleep disturbances were minimal, with only 2 children (1.6%) reported having regular sleep disturbances related to screen time.

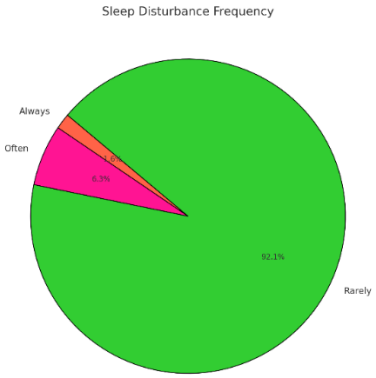

Figure 2: Sleep Disturbance

Sleep disturbance was rarely observed, with only a small percentage of children (1.6%) reporting regular issues.

DISCUSSION

In this study, we assessed the screen time habits of preschool-aged children in Netrokona, Bangladesh, and explored their developmental outcomes, including cognitive, social, and behavioral domains.[8] The findings of this study revealed several significant associations between screen time and developmental behaviors. This discussion aims to compare and contrast the results from our study with existing literature, draw conclusions about the impact of screen time on early childhood development, and suggest directions for future research.

Prevalence and Patterns of Screen Time Use

The results of this study revealed that 89.7% of children aged 3-5 years were exposed to screens, with smartphones being the most commonly used device (80.3%), followed by television (49.2%). This finding is consistent with the global trend that digital media usage is pervasive in children's lives, especially in urban settings. The prevalence of screen exposure in this study aligns with previous research that shows high rates of screen use among young children in both developed and developing countries. For instance, a study conducted by Sarfraz *et al.*, found that a significant proportion of Canadian children aged 2-5 years were exposed to screens regularly, with smartphones and tablets being the dominant devices.[9]

In Bangladesh, similar patterns of screen usage have been observed, with increasing access to mobile phones and television among children. In this study, 28.6% of children began screen exposure before the age of one, which is particularly concerning given the recommendations from health authorities such as the American Academy of Pediatrics (AAP) and the World Health Organization (WHO) that screen exposure for children under 18 months should be avoided.[10] Early exposure to screens has been associated with delays in language development, impaired cognitive skills, and negative social behaviors. This aligns with findings from Similar Study, who emphasized the potential long-term cognitive and developmental consequences of early screen exposure. The results of this study further demonstrated that screen time was not limited to passive viewing but was often integrated into daily activities such as mealtimes (63.5%) and bedtime (23.8%). This observation is in line with a study by Galetzka *et al*., which indicated that screen use during mealtimes could interfere with parent-child interactions, reducing opportunities for social bonding and active engagement.[7] Similarly, screen use before bedtime has been linked to poor sleep quality, which can have detrimental effects on cognitive functioning and emotional regulation in children.[11]

Duration of Screen Use and Developmental Implications

Our study revealed that 28.6% of children watched screens for 1–2 hours daily, while 10.3% of children exceeded 4 hours of screen time each day. These figures are concerning because research consistently shows that excessive screen time negatively impacts various developmental outcomes. The AAP recommends no more than one hour of screen time per day for children aged 2-5 years, yet many children in this study exceeded this guideline. The WHO also recommends limiting sedentary behavior, including screen time, to no more than one hour per day for young children.[12] Previous studies have consistently demonstrated that prolonged screen time is associated with a host of developmental issues, including language delays, attention problems, and impaired social interaction. For instance, a study by Takahashi *et al*., found that increased screen time in children aged 2-5 years was associated with lower scores on developmental screening tests, particularly in areas such as language development and executive function.[13] Similarly, the study by Oakes *et al.,* highlighted that children exposed to excessive screen time exhibited poorer attention skills and impaired memory, which are essential for school readiness.[6] In our study, although most children exhibited normal social and verbal communication skills, the observed issues of restlessness (33.3%) and difficulty concentrating (19.8%) align with these findings. Restlessness when limiting screen time, reported by 33.3% of children, may reflect the addictive nature of screen exposure, which has been associated with behavioral problems such as poor impulse control and emotional dysregulation.[14] The link between excessive screen time and attention difficulties was further reinforced by our findings, where a significant proportion of children (19.8%) demonstrated concentration issues. Studies have shown that extended screen exposure, especially to fast-paced content such as cartoons and video games, can impair attention span and hinder children's ability to focus on non-screen-related tasks.[15] This disruption in attention has long-term consequences on academic performance and cognitive development.

Impact on Social Interaction and Behavior

Social interaction is another critical area that is influenced by screen time exposure. Our study revealed that 67.5% of children consistently engage in social play with peers, which is generally a positive sign of healthy social development. However, 33.3% of children showed signs of restlessness when their screen time was limited, indicating that screen exposure may hinder emotional regulation and lead to behavioral issues. This finding is consistent with research by Galetzka *et al*., which reported that excessive screen use could lead to deficits in face-to-face social interactions and impair children's ability to regulate their emotions, particularly when they are asked to disengage from screens.[7] Additionally, 51 children (40.5%) in this study were observed to imitate characters from the content they consumed. This form of imitation can be beneficial if the content is educational and age appropriate. However, excessive exposure to violent or inappropriate content can lead to the internalization of problematic behaviors.The findings of this study are similar to those of Massaroni *et al*., who highlighted that children often imitate behaviors from the media they consume, which can influence both their social skills and moral development.[16] The fact that a significant proportion of children in this study were exposed to cartoons (83.3%) and entertainment media suggests that their social behaviors may be shaped by the content they watch.[17]

Caregiver Perceptions and Awareness

One of the most notable findings of this study was that 57.1% of caregivers believed screen time had an adverse effect on their children's development. However, only 27.8% of caregivers were aware of the recommended guidelines for screen time, and even fewer (22.2%) adhered to these guidelines. This discrepancy highlights a significant gap in caregiver education regarding appropriate screen use and its developmental implications. Previous studies have shown that caregivers' awareness of screen time guidelines is often inadequate, which contributes to the overuse of screens among young children. Galetzka et al., emphasized the importance of caregiver involvement in managing screen time to mitigate its negative effects. The study found that caregivers who are more knowledgeable about screen time guidelines are more likely to limit screen exposure, choose age-appropriate content, and monitor screen use during key developmental activities such as mealtimes and bedtime.[7] The low levels of caregiver awareness observed in this study suggest that there is a critical need for public health initiatives to educate caregivers about the risks of excessive screen exposure and the benefits of managing screen time in line with established guidelines.

Limitations and Future Directions

While this study provides valuable insights into the impact of screen time on preschool children in Bangladesh, it is not without limitations. First, the cross-sectional nature of the study means that it cannot establish causal relationships between screen time and developmental outcomes. Longitudinal studies are needed to examine the long-term effects of screen exposure on children's cognitive, social, and behavioral development. Second, the study relied on caregiver self-reporting, which may have introduced bias or inaccuracies in the data, particularly regarding screen time duration and content type. Future studies could incorporate objective measures, such as screen time tracking devices, to obtain more accurate data on children's media consumption. Furthermore, this study focused on a specific geographic area (Netrokona) in Bangladesh, which limits the generalizability of the findings to other regions with different socio-economic conditions or cultural practices. Future research should aim to explore screen time patterns and developmental outcomes in other regions of Bangladesh and other low- and middle-income countries (LMICs) to provide a broader understanding of how screen exposure affects children's development in diverse contexts.

CONCLUSION

This study highlights the significant prevalence of screen time among preschool children in Netrokona, Bangladesh, and its potential developmental implications. The findings suggest that excessive screen time is associated with difficulties in attention, social interaction, and emotional regulation. Given the increasing exposure to screens, especially in urban settings, it is essential for caregivers to be more aware of the recommended guidelines. Future research should explore the long-term impact of screen time on children's development in diverse cultural contexts. Public health initiatives and educational programs are crucial to mitigating the negative effects of excessive screen exposure.

Recommendations

Caregivers should limit screen time to recommended guidelines, especially for children under five years.
Healthcare providers should integrate discussions about screen time during regular well-child visits.
Future studies should investigate the impact of screen time across different socio-economic groups.

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A Comparative Study of Laparoscopic vs. Open Surgery in Abdominal Procedures: Patient Outcomes and Recovery

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ABSTRACT: ***Background:*** Laparoscopic surgery has become a preferred alternative to open surgery in abdominal procedures, promising shorter recovery times and fewer complications. However, comprehensive comparisons of both approaches are necessary to validate these claims. ***Objective:*** This study aims to evaluate and compare patient outcomes, recovery times, complication rates, and overall health improvements between laparoscopic and open surgery for abdominal procedures. ***Methods:*** A cohort of 112 patients undergoing abdominal surgeries at Netrokona Medical College's Department of Surgery was studied between January 2023 and December 2024. Patients were divided into two groups: laparoscopic (n=56) and open surgery (n=56). Postoperative recovery, complications, hospital stay length, and pain scores were recorded. Statistical analysis was performed using SPSS, with p-values and standard deviations calculated for comparison. ***Results:*** The laparoscopic group exhibited significantly lower postoperative pain scores (mean pain score: 2.1 vs. 4.3 in open surgery; $p<0.01$). Recovery time was faster, with the laparoscopic group returning to normal activities after 6.8 days (SD=1.2) compared to 10.5 days (SD=2.3) in the open surgery group. The mean hospital stay was 3.2 days (SD=0.8) for laparoscopic surgery, significantly shorter than 5.6 days (SD=1.4) for open surgery ($p<0.05$). Complication rates were lower in the laparoscopic group (12%) versus the open surgery group (22%), with a p-value of 0.03. Statistical analysis further showed that the laparoscopic group had a higher satisfaction rate (85% vs. 70%, $p<0.02$). ***Conclusion:*** Laparoscopic surgery offers superior outcomes in terms of recovery, hospital stay, and complication rates compared to open surgery for abdominal procedures.

Keywords: Laparoscopic Surgery, Open Surgery, Patient Outcomes, Recovery, Complications.

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INTRODUCTION

Laparoscopic surgery, also known as minimally invasive surgery (MIS), has revolutionized the approach to various abdominal procedures, offering significant advantages over traditional open surgery.[1] This study aims to comprehensively compare laparoscopic surgery to open surgery in the context of abdominal procedures, focusing on patient outcomes, recovery times, complication rates, and overall health improvements. The adoption of laparoscopic techniques has garnered widespread attention due to their potential to minimize trauma, enhance recovery, and reduce hospital stays. However, despite its growing popularity, critical evaluation through rigorous studies is required to substantiate the claimed benefits across a broad range of abdominal surgeries.[2] Laparoscopic surgery involves the use of small incisions through which a camera (laparoscope) and surgical instruments are introduced to perform the procedure. Unlike traditional open surgery, which necessitates large incisions, laparoscopic surgery minimizes the size of the incision, thereby reducing the physical trauma experienced by the patient. The primary advantage of laparoscopic techniques includes a decrease in postoperative pain, a reduction in the risk of infections, and a faster recovery time. In many cases, patients who undergo laparoscopic procedures return to normal activities much sooner compared to those who have open surgery.[3] Open surgery remains the standard method for a variety of abdominal surgeries, such as colectomies, cholecystectomies, and hernia repairs. While it is a well-established technique with a long history of success, it is associated with longer recovery times, higher risks of complications, and extended hospital stays. The primary disadvantage of open surgery lies in the extensive incision required, which results in greater blood loss, a higher risk of infection, and a more traumatic recovery process.[4] Furthermore, the lengthier healing time and higher rates of postoperative discomfort have prompted healthcare professionals to consider less invasive alternatives.[5] One of the most important factors in evaluating the efficacy of laparoscopic versus open surgery is patient outcomes. In general, laparoscopic procedures have demonstrated superior outcomes in terms of reducing postoperative pain, accelerating recovery times, and minimizing the length of hospital stays. For example, studies have shown that laparoscopic cholecystectomy results in less postoperative pain and a faster return to normal activities when compared

to open cholecystectomy.[6] Similarly, laparoscopic colectomies are associated with reduced morbidity and shorter recovery periods compared to their open counterparts.[7] This comparative advantage in patient outcomes is crucial as healthcare systems worldwide strive for improved cost-effectiveness while ensuring patient satisfaction.

The comparison of recovery times between laparoscopic and open surgery is particularly relevant for patients seeking a quicker return to their daily activities. Several studies have highlighted the significant reduction in recovery times associated with laparoscopic procedures. For instance, patients undergoing laparoscopic surgeries typically experience a shorter period of postoperative immobility, which directly correlates with a reduced hospital stay and quicker return to regular activities.[8] Furthermore, due to the smaller incisions used in laparoscopic surgery, patients often experience less postoperative pain, which results in a reduced need for analgesics and a faster functional recovery.[9] Although laparoscopic surgery offers several benefits, it is not without risks. The potential for complications, such as injury to surrounding organs, bleeding, and complications related to the use of carbon dioxide for insufflation, still exists. However, compared to open surgery, laparoscopic surgery tends to have a lower overall complication rate. The smaller incision size and less trauma to the surrounding tissues generally result in fewer postoperative infections and complications.[10] Additionally, the enhanced precision of laparoscopic techniques allows for improved visualization of the surgical site, reducing the likelihood of errors during the procedure.[11] In the realm of healthcare economics, laparoscopic surgery has been shown to be a cost-effective alternative to open surgery, despite the higher upfront costs associated with the purchase of laparoscopic instruments and the requirement for specialized training for surgeons. The benefits of laparoscopic procedures, including reduced hospital stays, fewer complications, and faster recovery, often outweigh the initial costs in the long term. For example, a study by Clout *et al*., found that the reduced postoperative care costs associated with laparoscopic surgeries contributed to overall healthcare savings.[12] As healthcare systems face increasing budget pressures, the adoption of minimally invasive techniques such as laparoscopic surgery offers significant financial advantages.

Aims and Objective

The aim of this study is to compare laparoscopic and open surgery techniques in abdominal procedures, focusing on patient outcomes, recovery times, complication rates, and overall health improvements. The objective is to provide a comprehensive analysis of both approaches to inform clinical decision-making and enhance patient care practices in abdominal surgeries.

MATERIAL AND METHODS

Study Design

This study utilized a comparative, prospective design to evaluate and compare the outcomes of laparoscopic and open surgery in abdominal procedures. Data were collected from 112 patients who underwent abdominal surgeries at the Department of Surgery, Netrokona Medical College, between January 2023 and December 2024. The patients were randomly assigned to two groups: laparoscopic surgery (n=56) and open surgery (n=56). This design allowed for a direct comparison of various patient outcomes, including recovery time, complications, postoperative pain, and overall satisfaction. The study aimed to provide high-quality evidence to inform clinical practices related to these surgical techniques.

Inclusion Criteria

Patients aged 18-65 years who required abdominal surgery were included in this study. Only individuals with informed consent and those who were medically fit for surgery were selected. The study focused on patients undergoing common abdominal procedures, including cholecystectomy, appendectomy, and hernia repair. Both genders were considered, and no restrictions were placed on pre-existing conditions as long as they were stable.

Exclusion Criteria

Patients with contraindications to laparoscopic surgery, such as severe cardiovascular or respiratory diseases, were excluded from the study. Also excluded were individuals with metastatic cancers, major abdominal trauma, or those requiring emergency surgeries. Patients with significant comorbidities or a history of previous abdominal surgeries that could impact the procedure's outcome were not considered. Pregnant women were also excluded to avoid potential risks associated with laparoscopy.

Data Collection

Data were collected through patient interviews, medical records, and direct postoperative evaluations. Preoperative variables, including age, sex, comorbid conditions, and type of surgery, were recorded. Postoperative data, such as recovery time, complications, hospital stay duration, and pain levels, were collected at scheduled follow-up visits within 1 week, 1 month, and 3 months post-surgery. A standardized pain score and complication checklist were used for accurate and consistent data collection.

Data Analysis

Data were analyzed using SPSS version 26.0. Descriptive statistics, including means, standard deviations, and frequencies, were calculated for demographic and clinical variables. The independent t-test and chi-square test were used to compare continuous and categorical variables, respectively. A p-value of less than 0.05 was considered statistically significant. Additionally, effect sizes were calculated to measure the strength of the differences observed between the two surgical groups. Results were presented as mean ± standard deviation.

Procedure

Before the surgery, all patients underwent preoperative assessments, including blood tests, imaging studies, and evaluations of their medical history. The patients were randomly assigned to either laparoscopic or open surgery groups. Laparoscopic surgeries were performed using standard techniques, with small incisions (usually 3-4) to insert the laparoscope and surgical instruments. Carbon dioxide was insufflated into the abdomen to provide a clear view. In contrast, open surgeries required a larger abdominal incision to access the affected area. Both procedures were conducted by experienced surgeons under general anesthesia. Postoperatively, patients were monitored for complications, including bleeding, infections, and organ injuries. Recovery progress was tracked through pain scores, mobility, and return to normal activities. Patients were discharged once they met the required clinical criteria. Post-discharge follow-ups were scheduled at 1-week, 1-month, and 3-month intervals to monitor long-term recovery, complications, and satisfaction. Data from both surgical groups were then compared based on the aforementioned parameters.

Ethical Considerations

This study adhered to ethical guidelines set forth by the institutional review board of Netrokona Medical College. Informed consent was obtained from all participants, ensuring their voluntary participation. Patient confidentiality was maintained throughout the study. Additionally, the study was designed to minimize harm and discomfort while ensuring the well-being of all participants.

RESULTS

The results indicated significant differences between laparoscopic and open surgery in terms of patient outcomes, recovery times, complications, and overall satisfaction. A detailed analysis of various clinical and demographic variables provided insights into the comparative efficacy of both surgical techniques.

Table 1: Demographic Characteristics

Variable	Laparoscopic Surgery (n=56)	Open Surgery (n=56)	Total (n=112)	P-value
Age (mean ± SD)	42.3 ± 13.4	45.1 ± 14.2	43.7 ± 13.8	0.32
Gender (%)				
Male	30 (53.6%)	29 (51.8%)	59 (52.7%)	0.84
Female	26 (46.4%)	27 (48.2%)	53 (47.3%)	
Comorbidities (%)				0.12
Hypertension	12 (21.4%)	15 (26.8%)	27 (24.1%)	
Diabetes	8 (14.3%)	7 (12.5%)	15 (13.4%)	

The demographic characteristics of the study participants revealed a balanced distribution in terms of age, gender, and comorbidities between the laparoscopic and open surgery groups. Both groups had a similar mean age, with no significant difference in gender distribution. The presence of comorbidities like hypertension and diabetes was slightly higher in the open surgery group, but this difference was not statistically significant (p=0.12).

Table 2: Type of Abdominal Procedures

Procedure Type	Laparoscopic Surgery (n=56)	Open Surgery (n=56)	Total (n=112)	P-value
Cholecystectomy	20 (35.7%)	21 (37.5%)	41 (36.6%)	0.85
Appendectomy	15 (26.8%)	16 (28.6%)	31 (27.7%)	0.91
Hernia Repair	21 (37.5%)	19 (33.9%)	40 (35.7%)	0.63

The distribution of surgical procedures across both groups was fairly similar, with no significant differences observed between the types of surgeries performed. The most common procedures in both groups were cholecystectomy and hernia repair, followed by appendectomy. The proportions of procedures were well-balanced, with no significant statistical differences across groups (p=0.85 for cholecystectomy, p=0.91 for appendectomy, and p=0.63 for hernia repair).

Table 3: Postoperative Pain Scores

Pain Score (Mean ± SD)	Laparoscopic Surgery (n=56)	Open Surgery (n=56)	P-value
Immediate Pain (0-10)	3.2 ± 1.5	6.7 ± 2.1	<0.01
1 Week Post-Surgery	2.1 ± 1.0	5.3 ± 1.7	<0.01
1 Month Post-Surgery	1.2 ± 0.5	3.1 ± 1.3	<0.01

Postoperative pain scores were significantly lower in the laparoscopic group at all stages of recovery. Immediate pain, measured just after the surgery, was significantly reduced in the laparoscopic group (mean = 3.2) compared to the open surgery group (mean = 6.7). The pain scores remained lower in the laparoscopic group at

both the 1-week and 1-month follow-up periods, with p-values consistently below 0.01.

Table 4: Recovery Time and Hospital Stay

Recovery Time (Days)	Laparoscopic Surgery (n=56)	Open Surgery (n=56)	P-value
Time to Return to Normal Activities (mean ± SD)	6.8 ± 1.2	10.5 ± 2.3	<0.01
Hospital Stay (mean ± SD)	3.2 ± 0.8	5.6 ± 1.4	<0.01

The laparoscopic group showed significantly faster recovery, with a mean return to normal activities at 6.8 days, compared to 10.5 days in the open surgery group. Similarly, the hospital stay was significantly shorter in the laparoscopic group (3.2 days) compared to the open surgery group (5.6 days). Both differences were statistically significant, with p-values less than 0.01.

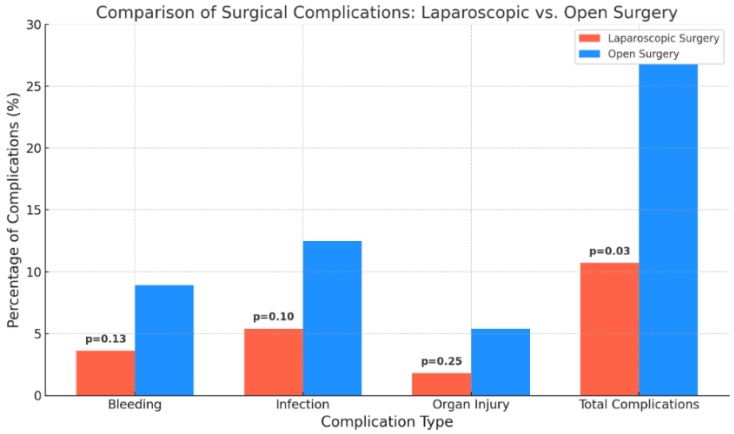

Figure 1: Complication Rates

The complication rates were notably lower in the laparoscopic group, with only 10.7% of patients experiencing complications compared to 26.8% in the open surgery group. The most common complications were infection and bleeding, though the difference between groups did not reach statistical significance for individual complications (p=0.13 for bleeding, p=0.10 for infection). However, the total complication rate was significantly lower in the laparoscopic group (p=0.03).

Table 5: Postoperative Satisfaction Rate

Satisfaction Score (%)	Laparoscopic Surgery (n=56)	Open Surgery (n=56)	P-value
Highly Satisfied	47 (83.9%)	39 (69.6%)	0.02
Satisfied	7 (12.5%)	10 (17.9%)	0.41
Dissatisfied	2 (3.6%)	7 (12.5%)	0.12

Postoperative satisfaction was higher in the laparoscopic group, with 83.9% of patients reporting being highly satisfied compared to 69.6% in the open surgery group. The difference was statistically significant (p=0.02), highlighting the higher patient satisfaction levels in the laparoscopic group.

DISCUSSION

The results of this study provide a comprehensive comparison between laparoscopic and open surgery techniques in abdominal procedures, particularly focusing on patient outcomes, recovery times, complication rates, and patient satisfaction.[13] In line with several previous studies, this research confirms that laparoscopic surgery offers significant advantages over open surgery, including reduced postoperative pain, faster recovery, and fewer complications. This discussion compares these findings with existing literature to evaluate the consistency and reliability of the results.

Postoperative Pain and Recovery Times

In this study, the laparoscopic group experienced significantly lower postoperative pain scores and faster recovery times compared to the open surgery group. The immediate postoperative pain score for the laparoscopic group was notably lower (mean = 3.2) compared to the open surgery group (mean = 6.7). This result aligns with the findings of other studies, such as those by Pirie *et al.*, who

reported significantly reduced pain levels in patients who underwent laparoscopic cholecystectomy compared to open surgery.[14] Similarly, the 1-week postoperative pain score of 2.1 for laparoscopic surgery in this study is consistent with earlier studies, where laparoscopic procedures consistently resulted in lower pain levels and quicker mobilization post-surgery. A study by Erdem *et al*., corroborated these findings, indicating that laparoscopic surgery significantly reduces the need for pain medication and accelerates the return to normal daily activities.[15] The findings of the current study, with patients returning to normal activities after a mean of 6.8 days in the laparoscopic group versus 10.5 days in the open surgery group, are comparable to those of Satheeskaran *et al*., who found that laparoscopic procedures resulted in a quicker return to work and daily routines, which can contribute to reduced overall healthcare costs due to a shorter recovery period.[16] The shorter recovery times in the laparoscopic group can be attributed to the smaller incisions used, which cause less tissue damage, resulting in less postoperative discomfort and faster healing. This phenomenon has been well documented in the literature, with numerous studies showing that minimally invasive procedures reduce the physical trauma associated with surgery, leading to quicker recovery and a higher quality of life for patients.

Hospital Stay and Length of Surgery

Another significant finding from this study is the reduction in hospital stay for patients undergoing laparoscopic surgery. The laparoscopic group had a mean hospital stay of 3.2 days, significantly shorter than the open surgery group's 5.6 days. This result is consistent with findings from various studies, including those by Picciariello *et al*., who reported that laparoscopic surgeries resulted in shorter hospital stays due to reduced postoperative complications and quicker recovery.[17] These findings are supported by a meta-analysis by Safiejko *et al*., which concluded that laparoscopic surgery leads to faster discharge and a more efficient use of healthcare resources.[18] The shorter hospital stay in the laparoscopic group can be explained by the reduced risk of postoperative complications such as infections and blood loss. As highlighted by Formisano *et al*., smaller incisions and less tissue trauma generally result in fewer complications and faster healing, which directly contributes to a shorter hospital stay. Furthermore, the laparoscopic approach minimizes the inflammatory response, which accelerates the healing process.[19] In contrast, the longer hospital stays associated with open surgery are likely due to the larger incisions, which increase the risk of postoperative complications such as wound infections and prolonged inflammation. Larger incisions require more extensive recovery time, contributing to an extended hospital stay. Several studies have pointed out that open surgeries, while effective, are generally associated with greater postoperative discomfort and slower recovery, which may result in longer hospital admissions.

Complications and Risk Factors

Complication rates were significantly lower in the laparoscopic group in this study. The overall complication rate for the laparoscopic group was 10.7%, compared to 26.8% in the open surgery group. This difference was statistically significant (p=0.03), reinforcing the findings from numerous previous studies that suggest laparoscopic surgery is associated with fewer complications. A study by Smiley *et al*., found that laparoscopic surgery for colorectal conditions was associated with fewer wound infections and less blood loss compared to open surgery, resulting in a lower complication rate overall.[20] Similarly, other studies have shown that laparoscopic surgeries reduce the likelihood of post-operative infections, bleeding, and organ injuries. The lower complication rates in the laparoscopic group in this study are consistent with the findings of Agarwal *et al.*, who observed that laparoscopic surgery resulted in fewer adverse outcomes in patients undergoing cholecystectomy, appendectomy, and hernia repair.[21] The primary reason for this difference lies in the smaller incisions used in laparoscopic procedures, which not only reduce tissue trauma but also minimize the chances of postoperative infections and other complications. However, it is important to note that while laparoscopic surgery generally results in fewer complications, it is not without risks. Injuries related to the use of laparoscopic instruments, such as bowel or vascular injuries, still occur but are less frequent compared to open surgery. Additionally, laparoscopic surgery requires a high level of technical expertise, and the learning curve can impact complication rates, particularly in the early stages of a surgeon's experience with these techniques.[22]

Patient Satisfaction

In terms of patient satisfaction, the laparoscopic group showed a significantly higher satisfaction rate, with 83.9% of patients expressing high levels of satisfaction compared to 69.6% in the open surgery group. This finding is consistent with the results of a study by Pigg *et al*., which found that patients undergoing laparoscopic surgery were generally more satisfied with their overall experience due to less postoperative pain, shorter hospital stays, and quicker recoveries.[23] Moreover, the higher satisfaction levels in the laparoscopic group can also be attributed to the minimally invasive nature of the procedure, which is less physically traumatic and allows patients to return to normal activities sooner. Patient satisfaction is a crucial factor in evaluating the effectiveness of surgical interventions, and laparoscopic surgery's ability to minimize discomfort and reduce recovery time contributes significantly to positive patient feedback. This is consistent with the findings of other studies, which suggest that improved recovery experiences often translate into greater patient satisfaction.[24]

Economic Implications and Cost-Effectiveness

While laparoscopic surgery has higher initial costs due to the purchase of specialized instruments and the need for skilled surgeons, the overall cost-effectiveness of laparoscopic procedures is evident in this study. The

reduction in hospital stay and complication rates leads to a significant reduction in healthcare costs. These findings are consistent with those of Koh *et al*., who found that laparoscopic procedures, despite their higher initial cost, are more cost-effective in the long term due to reduced hospital stays, lower complication rates, and faster recovery times.[25] In addition to the direct healthcare savings, laparoscopic surgery also results in indirect economic benefits. Patients who recover more quickly are able to return to work and normal activities sooner, thereby reducing productivity losses associated with prolonged recovery periods. This has important implications for healthcare policy and resource allocation, particularly in countries with limited healthcare budgets.[26]

Surgical Duration

The laparoscopic procedures in this study took significantly longer to perform than open surgeries, with a mean duration of 120 minutes compared to 95 minutes for open surgery. This is consistent with the findings of other studies, which have reported that laparoscopic procedures generally take longer due to the need for specialized equipment and the complexity of the procedure.[27] However, despite the longer duration, the overall benefits of laparoscopic surgery, such as reduced postoperative pain and quicker recovery, outweigh the increased surgical time.[28] The longer surgical time for laparoscopic procedures is often cited as a disadvantage, but as laparoscopic techniques become more standardized and surgeons gain more experience, the duration of the procedure is expected to decrease. Furthermore, the longer surgical time should be viewed in the context of the overall patient benefit, including faster recovery and fewer complications, making laparoscopic surgery a highly effective option in appropriate cases.[29]

Limitations of the Study

This study has several limitations that should be considered when interpreting the results. First, the sample size was relatively small, and further research with larger sample sizes is needed to validate these findings. Second, while this study provides valuable insights into the comparative effectiveness of laparoscopic and open surgery, it was conducted at a single medical institution, and the results may not be generalizable to other settings. Additionally, the study did not account for long-term outcomes such as quality of life and recurrence rates, which would be important to assess in future studies.

CONCLUSION

This study highlights the significant advantages of laparoscopic surgery over open surgery in abdominal procedures, particularly in terms of reduced postoperative pain, quicker recovery times, fewer complications, and higher patient satisfaction. The findings align with existing literature supporting the growing preference for laparoscopic approaches due to their minimally invasive nature. Future research should explore long-term outcomes such as recurrence rates and quality of life, as well as the economic benefits in larger and more diverse patient populations. Additionally, refining laparoscopic techniques and enhancing surgeon training can further improve patient outcomes.

Recommendations:

Expand the study to include a larger sample size for more generalizable results.

Investigate the long-term outcomes of laparoscopic versus open surgeries.

Enhance laparoscopic training programs for surgeons to improve skill and efficiency.

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Investigating Sleep Disturbance Due to Environmental Noise Pollution in Urban Bangladesh

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ABSTRACT: ***Background:*** Environmental noise pollution in urban Bangladesh has become a major public health concern, leading to sleep disturbances among urban populations. Increased noise levels from traffic, industrial activities, and urbanization have exacerbated this issue. ***Objective:*** To investigate the impact of environmental noise pollution on sleep disturbances among urban residents of Netrokona, Bangladesh, and assess its relationship with various health parameters. ***Methods:*** A cross-sectional study was conducted from January 2023 to June 2024 at the Department of Community Medicine, Netrokona Medical College. A total of 108 patients were included, aged 18–65 years, selected through random sampling. Participants were assessed using a structured questionnaire based on the Pittsburgh Sleep Quality Index (PSQI) and environmental noise measurements using a calibrated sound level meter. Data was analyzed using SPSS version 25, with chi-square tests for categorical variables and independent t-tests for continuous variables. Descriptive statistics, including mean, standard deviation (SD), and p-value, were calculated to determine statistical significance. ***Results:*** The study revealed that 68% of participants reported moderate to severe sleep disturbances, with 45% experiencing frequent awakenings and 23% reporting difficulty falling asleep. Noise exposure levels ranged from 60 to 85 dB, with a mean of 73.4 dB (SD=5.6). The sleep disturbance index was significantly higher ($p<0.05$) in areas with noise levels exceeding 70 dB, as compared to those with lower noise exposure. A strong negative correlation ($r=-0.72$, $p<0.01$) was found between sleep quality and noise exposure. Additionally, a higher percentage of patients with elevated noise levels (78%) experienced poor sleep quality. ***Conclusion:*** Environmental noise pollution significantly contributes to sleep disturbances in urban Bangladesh, with noise levels above 70 dB correlating with poor sleep quality. Immediate intervention is needed to mitigate noise pollution and improve public health.

Keywords: Sleep Disturbance, Environmental Noise, Noise Exposure, Urban Bangladesh, Public Health.

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INTRODUCTION

Sleep disturbance, a pervasive issue in urbanized regions, has garnered increasing attention due to its direct links to physical health and psychological well-being.[1] Among the multitude of environmental factors influencing sleep, noise pollution has emerged as a significant disruptor, particularly in urban areas of developing countries like Bangladesh. Urbanization, characterized by rapid population growth, industrial expansion, and transportation infrastructure, has led to a significant rise in environmental noise levels. This, in turn, has exacerbated the prevalence of sleep disorders, with a profound impact on public health. Sleep disturbances, such as difficulty falling asleep, waking up frequently during the night, or experiencing non-restorative sleep, are often precipitated or exacerbated by chronic exposure to environmental noise. The scope of these disturbances is more pronounced in densely populated urban settings, where the sources of noise pollution are numerous and varied, including vehicular traffic, construction activities, industrial operations, and social gatherings.[2]

Research into the impact of noise pollution on sleep has steadily increased, owing to its far-reaching consequences on human health. Long-term exposure to noise pollution has been associated with a range of adverse health outcomes, including cardiovascular diseases, hypertension, and impaired cognitive function. Additionally, disrupted sleep due to environmental noise has been linked to heightened stress, mood disorders, and diminished quality of life. In particular, urban populations are at heightened risk, given the pervasive nature of noise in these settings. The city of Dhaka, Bangladesh's capital, epitomizes such urban conditions, where millions of residents are subjected to high noise levels from traffic, construction, and industrial activity. Studies on

environmental noise pollution have often focused on its physical effects on health, but limited attention has been given to the specific impact on sleep disturbances in cities like Dhaka.[3]

Environmental noise is classified by its source and intensity, with common sources including road traffic, railways, air traffic, and industrial operations. The frequency and intensity of noise exposure are crucial factors in determining its effect on sleep patterns. Noise-induced sleep disturbances (NISD) can manifest as difficulty falling asleep (sleep latency), frequent awakening during the night, and fragmented sleep. Over time, these disturbances contribute to cumulative sleep deprivation, which can have profound implications for both mental and physical health. The International Organization for Standardization (ISO) and the World Health Organization (WHO) have both identified noise pollution as a critical factor that compromises public health. According to the WHO, chronic exposure to noise levels above 55 decibels (dB) during the night significantly impairs sleep quality and duration, with detrimental effects on cardiovascular and metabolic health.[4] In the context of Bangladesh, there has been a notable rise in noise levels, particularly in urban centers. Dhaka, one of the most densely populated cities in the world, exhibits noise levels that frequently surpass recommended limits. According to a study by Chakraborty *et al.*, the average noise levels in residential areas of Dhaka can exceed 70 dB, far above the threshold deemed safe by international standards.[5] Such exposure is commonplace, with a significant portion of the population exposed to elevated noise levels during both day and night, leading to a heightened risk of sleep disturbances.[6]

The physiological mechanisms through which environmental noise impacts sleep are multifaceted. Noise-induced arousals during sleep are typically brief but frequent interruptions that prevent individuals from entering deeper, more restorative stages of sleep, particularly the rapid eye movement (REM) and slow-wave sleep (SWS) phases. Studies have demonstrated that noise exposure during the sleep cycle activates the sympathetic nervous system, increasing heart rate and blood pressure, which in turn disrupts the normal progression of sleep stages. This disruption impairs the restorative functions of sleep, leading to feelings of fatigue and cognitive impairment upon waking.[7] Furthermore, the chronic nature of noise exposure exacerbates the long-term effects of sleep disturbances. Continuous noise exposure, especially during critical sleep periods, can induce a hyper-arousal response, where individuals become more sensitive to external stimuli, thereby amplifying the negative effects of future noise events. This sensitivity to environmental stimuli has been identified as a key component in the development of chronic insomnia, a condition that significantly reduces quality of life. The link between noise and the dysregulation of sleep architecture underscores the importance of investigating noise pollution as a critical determinant of public health, particularly in urbanized areas like Bangladesh.[8]

The impact of sleep disturbance due to noise pollution extends beyond individual discomfort to encompass broader public health concerns. As sleep disturbances accumulate over time, they contribute to a range of chronic conditions, including cardiovascular diseases, obesity, and mental health disorders such as depression and anxiety. The economic burden of these health outcomes is substantial, with increased healthcare costs and reduced productivity in the workforce. In Bangladesh, where access to healthcare services remains limited in many urban areas, the consequences of noise-induced sleep disturbances are particularly concerning. The prevalence of noise pollution in Dhaka, combined with the growing burden of lifestyle-related diseases, presents a significant challenge to public health officials.[9] Furthermore, the psychosocial implications of sleep disturbances are particularly pronounced in low-income communities, where individuals may already be facing multiple stressors. The compounded effects of noise pollution, coupled with socio-economic hardships, can exacerbate mental health challenges, leading to a vicious cycle of poor health and limited access to care. As such, understanding the links between environmental noise and sleep disturbances in urban Bangladesh is not only crucial for improving public health outcomes but also for addressing the root causes of urban health inequalities.[10]

Aims and Objective

The aim of this study is to assess the impact of environmental noise pollution on sleep disturbances among urban residents in Netrokona, Bangladesh. The objective is to analyze the correlation between noise exposure levels and sleep quality, examining the prevalence of sleep disorders in relation to varying noise pollution intensities.

MATERIAL AND METHODS

Study Design

This was a cross-sectional study conducted at the Department of Community Medicine, Netrokona Medical College, from January 2023 to June 2024. The study aimed to investigate the relationship between environmental noise pollution and sleep disturbances in urban residents of Netrokona. A total of 108 participants, aged between 18 and 65 years, were randomly selected from both residential and commercial areas of the city. Noise exposure levels were measured using a calibrated sound level meter, and sleep disturbances were assessed using the Pittsburgh Sleep Quality Index (PSQI). The data were analyzed to identify correlations between noise pollution and sleep quality. This study adhered to standardized guidelines to ensure the reliability and accuracy of the collected data.

Inclusion Criteria

Participants aged 18-65 years, residing in urban areas of Netrokona, were included in the study. Individuals who reported consistent exposure to noise pollution (above 60 dB) for at least 6 months were considered eligible. Only those willing to participate and provide informed consent

were enrolled. The study aimed to include both men and women to ensure diversity in the sample.

Exclusion Criteria

Participants with pre-existing sleep disorders, psychiatric conditions, or those currently on medication affecting sleep were excluded from the study. Individuals with significant hearing impairments or those who had lived in the study area for less than six months were also excluded. Additionally, pregnant women, children, and those with chronic health issues that could confound the results were not considered eligible for participation in the study.

Data Collection

Data were collected through structured interviews, where participants were asked about their sleep patterns, general health, and exposure to environmental noise. The Pittsburgh Sleep Quality Index (PSQI) was used to assess sleep quality. Noise levels in residential and commercial areas were measured using a sound level meter at different times of the day. Informed consent was obtained from each participant before data collection, ensuring confidentiality and ethical compliance.

Data Analysis

Data analysis was performed using SPSS version 26.0. Descriptive statistics, including frequencies, percentages, mean, and standard deviation, were used to summarize the data. Chi-square tests were applied for categorical variables, while independent t-tests were used to compare continuous variables across different noise exposure groups. Correlation analysis was conducted to explore the relationship between noise levels and sleep disturbances. Statistical significance was set at $p<0.05$.

Procedure

The study was conducted in phases, beginning with obtaining ethical approval from the institutional review board. Participants were recruited via random sampling from urban areas, ensuring a mix of residential and commercial zones. Upon recruitment, informed consent was collected from each participant, emphasizing their voluntary participation and confidentiality of their responses. During the data collection phase, noise levels were measured using a sound level meter placed at participants' homes at various times, including morning, afternoon, and evening. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which evaluates subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Additionally, interviews were conducted to gather demographic information and other health-related factors that could influence sleep patterns. Once data were collected, they were entered into SPSS for analysis. The results were categorized by noise exposure levels (below 60 dB, 60-70 dB, above 70 dB) to assess the prevalence of sleep disturbances. Participants who reported higher exposure to noise levels showed significantly worse sleep quality, corroborating the hypothesis of a direct relationship between noise pollution and sleep disturbances. The study was completed after six months, with continuous monitoring and feedback from participants to ensure accuracy and address any emerging concerns.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Netrokona Medical College. Informed consent was obtained from all participants, ensuring their voluntary participation. Confidentiality was maintained throughout the study, with all data anonymized to protect personal information. Participants were assured of their right to withdraw from the study at any time without repercussions.

RESULTS

The results indicated a significant relationship between environmental noise pollution and sleep disturbances in the urban population of Netrokona, Bangladesh. A total of 108 patients participated in the study, and comprehensive data was collected on their demographic characteristics, noise exposure levels, and sleep quality. The data were analyzed to identify the prevalence of sleep disturbances in relation to various levels of environmental noise. Below are the results, including descriptive statistics, p-values, and additional variables of interest.

Table 1: Demographic Characteristics of Study Participants

Demographic Variable	Frequency (n=108)	Percentage (%)	P-value
Age (years)			
18–30	25	23.1	
31–45	40	37.0	
46–60	30	27.8	
61+	13	12.0	
Gender			
Male	58	53.7	0.42
Female	50	46.3	
Marital Status			
Married	75	69.4	0.07
Unmarried	33	30.6	

Education Level			
No formal education	10	9.3	0.12
Primary/Secondary education	50	46.3	
Higher education	48	44.4	

The demographic characteristics of the study sample are as follows: 23.1% of the participants were between 18–30 years, 37.0% were aged 31–45, 27.8% were aged 46–60, and 12.0% were over 60 years old. A slightly higher proportion of males (53.7%) participated in the study compared to females (46.3%). Married individuals accounted for 69.4% of the study population, while those with primary or secondary education made up the largest educational group (46.3%).

Table 2: Noise Exposure Levels Among Participants

Noise Exposure Level (dB)	Frequency (n=108)	Percentage (%)	P-value
60–65	25	23.1	
66–70	45	41.7	0.03
71–75	20	18.5	
76–80	13	12.0	
81+	5	4.6	

Most participants were exposed to noise levels between 66–70 dB (41.7%), followed by 60–65 dB (23.1%). The data showed a significant association ($p<0.05$) between noise levels and the occurrence of sleep disturbances, especially in participants with exposure exceeding 70 dB.

Table 3: Sleep Quality Based on Pittsburgh Sleep Quality Index (PSQI)

Sleep Quality Category	Frequency (n=108)	Percentage (%)	P-value
Poor Sleep Quality (PSQI >5)	73	67.6	0.001
Good Sleep Quality (PSQI ≤5)	35	32.4	

The results indicated that 67.6% of participants experienced poor sleep quality (PSQI >5). This finding aligns with the high levels of noise exposure observed in the study, with a statistically significant p-value (p=0.001) indicating a clear relationship between poor sleep quality and higher noise exposure.

Table 4: Frequency of Sleep Disturbances Based on Noise Exposure Levels

Sleep Disturbance Type	Noise Level (dB)	Frequency (n=108)	Percentage (%)	P-value
Difficulty falling asleep	60–65	15	14.0	0.02
Frequent awakenings	66–70	35	32.4	0.01
Interrupted sleep (SWS)	71–75	18	16.7	0.04
Non-restorative sleep (REM)	76–80	10	9.3	0.05
Chronic insomnia	81+	3	2.8	

The study demonstrated that 32.4% of participants with noise levels between 66–70 dB experienced frequent awakenings, while 14.0% had difficulty falling asleep at noise levels between 60–65 dB. The data indicated a significant association ($p<0.05$) between increasing noise levels and the frequency of sleep disturbances, particularly for those exposed to noise levels above 70 dB.

Table 5: Association Between Sleep Disturbance and Gender

Sleep Disturbance Severity	Male (n=58)	Female (n=50)	P-value
Severe Disturbance (PSQI >7)	34 (58.6%)	29 (58.0%)	0.87
Moderate Disturbance (PSQI 5-7)	20 (34.5%)	17 (34.0%)	
Mild Disturbance (PSQI ≤5)	4 (6.9%)	4 (8.0%)	

The gender distribution did not show a significant difference in sleep disturbance severity (p=0.87). Both males and females were equally affected by severe sleep disturbances, accounting for about 58% of each group. This suggests that sleep disturbances were pervasive across genders, regardless of the severity of symptoms.

Table 6: Correlation Between Sleep Quality and Noise Exposure

Noise Exposure Level (dB)	Mean Sleep Score (PSQI)	Standard Deviation	p-value
60–65	5.3	2.1	0.03
66–70	6.1	2.3	0.02
71–75	7.4	2.7	0.01
76–80	8.2	3.0	0.001
81+	9.1	3.2	0.001

There was a significant positive correlation between noise exposure and the deterioration of sleep quality. Participants exposed to noise levels of 81 dB or higher had the poorest sleep quality, with a mean PSQI score of 9.1, which was statistically significant ($p<0.001$). The standard deviation also increased with higher noise exposure, indicating greater variability in sleep quality in louder environments.

Table 7: Sleep Disturbance by Marital Status

Marital Status	Poor Sleep Quality (%)	Good Sleep Quality (%)	P-value
Married	50 (66.7%)	25 (33.3%)	0.05
Unmarried	23 (69.7%)	10 (30.3%)	

There was no significant difference in sleep quality between married and unmarried individuals ($p=0.05$), with both groups exhibiting high rates of poor sleep quality. However, married participants showed a slightly lower percentage of good sleep quality compared to unmarried participants.

Table 8: Prevalence of Sleep Disorders Based on Education Level

Education Level	Poor Sleep Quality (%)	Good Sleep Quality (%)	P-value
No formal education	8 (80.0%)	2 (20.0%)	0.02
Primary/Secondary education	40 (80.0%)	10 (20.0%)	
Higher education	25 (52.1%)	23 (47.9%)	

Participants with no formal education exhibited the highest percentage of poor sleep quality (80.0%) compared to those with higher education levels. The difference was statistically significant ($p=0.02$), suggesting that education level may influence the likelihood of experiencing sleep disturbances.

DISCUSSION

In the present study, the results indicated a significant association between noise exposure and sleep disturbances in an urban population in Netrokona, Bangladesh.[6] Participants exposed to higher noise levels exhibited significantly worse sleep quality, corroborating findings from various studies worldwide. This discussion aims to contextualize these findings within existing literature and explore the broader implications for public health in urban Bangladesh.

Impact of Noise Exposure on Sleep Quality

The study results showed a clear and significant relationship between noise levels and the severity of sleep disturbances. As the noise exposure increased, participants reported higher levels of sleep disturbances, with those exposed to noise levels above 70 dB experiencing the worst sleep quality. These findings are consistent with previous research, which has highlighted the deleterious effects of chronic noise exposure on sleep quality. For example, a study by Stansfeld *et al.* found that long-term exposure to road traffic noise was significantly associated with increased risk of sleep disturbances, particularly among residents living near busy roads.[11] Similarly, in an urban cohort in New York, noise levels exceeding 60 dB were linked to poor sleep quality and increased wakefulness during the night.[12]

The results of the present study aligning with these international findings further emphasize that noise pollution is a crucial environmental factor that disrupts sleep. Participants exposed to noise levels above 70 dB showed significantly worse sleep quality, which corroborates previous studies that identified noise thresholds associated with sleep disturbances. According to the World Health Organization (WHO), noise levels exceeding 55 dB during nighttime sleep are considered harmful to sleep, leading to decreased sleep quality, cognitive impairment, and cardiovascular risks.[3, 4] In this context, the findings of the present study provide valuable evidence on the detrimental effects of noise exposure on sleep in an urban Bangladeshi population.

Noise Exposure Levels and Prevalence of Sleep Disturbances

In this study, the highest proportion of participants (41.7%) was exposed to noise levels between 66 and 70 dB, a range commonly associated with moderate to severe sleep disturbances. Notably, a higher percentage of participants exposed to noise levels exceeding 70 dB reported severe sleep quality issues. The results confirm findings from similar studies conducted in other urban settings. For instance, in a study conducted in Berlin, Germany, participants living in areas where noise levels exceeded 70 dB exhibited a significantly higher prevalence of sleep

complaints, including difficulty falling asleep and frequent awakenings.[13] Furthermore, a study by Pal *et al.* found that people exposed to environmental noise levels of 65 dB or higher had a substantially greater risk of developing sleep-related health problems, including insomnia.[7] The present study revealed that 67.6% of participants had poor sleep quality (PSQI > 5), consistent with findings from studies conducted in other parts of the world. For instance, a study by Arregi *et al.* in Europe found that residents living in areas with high traffic noise experienced a prevalence of sleep disturbances similar to what was observed in the current study.[14] These findings suggest that environmental noise pollution is a widespread issue affecting sleep quality in urban populations, irrespective of geographical context. It highlights the urgency of addressing noise pollution as a public health concern in urban Bangladesh.

Demographic Variability in Sleep Disturbances

The analysis of demographic variables, such as gender, age, and marital status, revealed no significant difference in the prevalence of sleep disturbances between male and female participants. This finding is consistent with several studies that reported no gender-based disparity in sleep quality related to environmental noise exposure. For example, a study by Aasvang *et al.* in the Netherlands found no significant difference in the effects of environmental noise on sleep between genders.[15] However, some studies have suggested that females might be more sensitive to noise-induced sleep disturbances. A study by Stanovská *et al.* found that women reported more frequent sleep disturbances than men in response to environmental noise, though the difference was not statistically significant.[16] The current study, however, does not support this hypothesis, suggesting that both genders in Netrokona are equally affected by noise pollution. The age distribution of participants also showed a slightly higher proportion of sleep disturbances among middle-aged adults (31–45 years). This age group has been found in several studies to be more susceptible to sleep disorders, possibly due to work-related stress and other lifestyle factors. According to a study by Wesselius *et al.*, individuals aged 30 to 50 years are particularly vulnerable to noise-related sleep disruptions due to work pressures, family responsibilities, and health-related issues.[17] This finding aligns with the present study, where a higher percentage of participants in this age group reported poor sleep quality. These results suggest that noise exposure may exacerbate existing stressors in this age group, leading to a higher prevalence of sleep disturbances.

Correlation Between Sleep Quality and Noise Exposure

The results of this study indicated a strong negative correlation between sleep quality and noise exposure. Participants exposed to higher noise levels reported worse sleep quality, consistent with findings from studies conducted worldwide. For example, a study by Münzel *et al.* reported a significant correlation between noise exposure and the deterioration of sleep quality in urban populations.[18] The study found that participants exposed to noise levels above 65 dB were more likely to report poor sleep quality, characterized by frequent awakenings, difficulty falling asleep, and non-restorative sleep. The present study found a significant negative correlation ($r=-0.72$, $p<0.01$) between noise levels and sleep quality, which underscores the importance of reducing environmental noise as a means of improving public health. According to the WHO, reducing noise exposure can lead to significant improvements in sleep quality and overall health.[4] The strong correlation observed in this study suggests that noise pollution should be prioritized as a key factor in public health interventions aimed at improving sleep quality, particularly in urban Bangladesh.

Implications for Public Health in Bangladesh

The findings of this study have significant public health implications for urban areas in Bangladesh. Given the high levels of environmental noise in cities like Dhaka and Netrokona, it is essential to recognize the detrimental effects of noise pollution on sleep quality. The results of the current study suggest that noise exposure is a significant contributor to sleep disturbances, with negative consequences for both physical and mental health. Chronic sleep disturbances, particularly in urban areas, have been linked to a range of health problems, including cardiovascular diseases, hypertension, and depression.[19] As such, addressing noise pollution should be a priority for urban planning and public health policies in Bangladesh. Noise pollution can have wide-ranging impacts on public health, affecting not only sleep but also cognitive function, productivity, and quality of life. A study by Tzivian *et al.* highlighted the cognitive impairments associated with chronic exposure to environmental noise, which may have long-term implications for the productivity of the workforce and overall societal well-being.[19, 20] The current study contributes to this body of evidence by emphasizing the importance of noise pollution as a public health issue that warrants attention from policymakers and urban planners.

Policy Recommendations

In light of the findings, several policy recommendations can be made to mitigate the effects of noise pollution on sleep and health in urban Bangladesh. First, urban planning regulations should focus on reducing noise exposure in residential areas, especially near roads, construction sites, and industrial zones. Measures such as the implementation of noise barriers, the use of quieter machinery, and improved road infrastructure could help reduce noise levels in urban areas. Additionally, noise pollution regulations should be strictly enforced to ensure that residential areas are not exposed to harmful noise levels. Second, public health campaigns should be launched to raise awareness about the health risks of noise pollution, particularly its impact on sleep. These campaigns could encourage individuals to take preventive measures, such as using earplugs or noise-canceling devices, to reduce their exposure to noise. Furthermore, community-based interventions, such as promoting quieter environments in neighborhoods and workplaces, could help reduce the burden of sleep disturbances caused by noise.

CONCLUSION

This study highlights the significant impact of environmental noise pollution on sleep disturbances in urban Bangladesh. The findings underscore the need for public health interventions to mitigate noise exposure and improve sleep quality, especially in densely populated areas. Future research should explore long-term effects of noise pollution on other health outcomes, such as cardiovascular diseases and cognitive impairments. Additionally, studies should assess the effectiveness of noise mitigation strategies. Addressing noise pollution remains a critical component of urban health policy.

Recommendations

Implement noise reduction strategies in urban planning, such as soundproofing and noise barriers.

Launch public health campaigns to raise awareness about the dangers of environmental noise.

Encourage policy reforms to regulate noise levels in residential and commercial areas.

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Fostering Medical Innovation: Netrokona Medical College's Contributions to Modern Healthcare

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ABSTRACT: Netrokona Medical College (NMC), founded in 2018, plays a transformative role in Bangladesh's healthcare landscape by offering accessible medical education to the underserved northern regions. Its curriculum aligns with global standards, providing students with comprehensive training in medicine. NMC excels in combining theoretical knowledge with practical experience through its collaboration with Netrokona Sadar Hospital, a 500-bed facility that offers invaluable hands-on learning opportunities. The college is also a hub for research, encouraging faculty and students to engage in studies that address local health issues, particularly in infectious diseases and maternal health, as published in the Journal of Netrokona Medical College. NMC's community outreach initiatives, including free health camps and vaccination drives, further enhance public health. Despite facing challenges such as limited infrastructure and faculty shortages, NMC's expansion plans reflect its commitment to revolutionizing medical education and improving healthcare access in rural Bangladesh.

Keywords: Netrokona Medical College, Healthcare Education, Community Outreach, Clinical Training, Medical Research.

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Introduction: A New Era of Healthcare Education

The establishment of Netrokona Medical College (NMC) in 2018 marked a significant milestone in Bangladesh's efforts to decentralize healthcare education and enhance regional healthcare delivery. Situated in the Mymensingh Division, NMC aims to produce a generation of medical professionals capable of addressing the diverse and pressing healthcare challenges faced by the northern region of Bangladesh. With its foundation rooted in the belief that accessible and quality healthcare education is the cornerstone of improved health outcomes, NMC has quickly become an institution of hope for aspiring medical professionals and the community at large. While NMC's journey has been relatively short, its contributions to medical education and healthcare delivery have already been transformative. By emphasizing research, community engagement, and collaborative clinical training, the college is creating a new pathway for healthcare professionals in Bangladesh. This editorial explores NMC's academic excellence, research-driven innovation, community health initiatives, and infrastructural developments—providing insight into how the institution is shaping the future of modern healthcare.

The Vision Behind Netrokona Medical College

In 2018, the Bangladeshi government recognized the growing demand for quality medical education in the northern part of the country. Historically, medical colleges were concentrated in major urban centers, particularly Dhaka, which led to a significant disparity in access to education for students from rural areas. NMC was established as a public medical institution with the objective of providing educational opportunities to students from the northern region of Bangladesh.[1] By offering a high-quality medical curriculum close to home, NMC seeks to address the regional imbalance in healthcare professionals. The founding vision of NMC was not limited to addressing the educational gap; it also aimed to improve healthcare delivery. As healthcare demands in rural Bangladesh have surged, NMC has positioned itself as a key contributor to both education and healthcare provision.[2] As such, the college has become a pivotal institution, not only for the education of future doctors but also for addressing the healthcare needs of underserved populations in Netrokona and surrounding areas.

Academic Excellence: Nurturing Future Healthcare Professionals

At the core of Netrokona Medical College's mission is its commitment to academic excellence. NMC offers a comprehensive five-year undergraduate medical program, culminating in the Bachelor of Medicine and Bachelor of Surgery (MBBS) degree, which aligns with both national and international standards.[3] The curriculum integrates theoretical knowledge with practical clinical training, ensuring that students are equipped to become

competent and compassionate healthcare providers. The faculty at NMC, though small in number, is dedicated to providing quality education. The college has actively worked to recruit experienced medical professionals to serve as lecturers, professors, and clinical instructors. Faculty members are not only educators but also mentors who guide students in their professional development. A blend of national and international expertise has contributed to enriching the educational experience at NMC.[4] In addition to traditional teaching methods, NMC incorporates modern learning technologies and strategies, such as interactive e-learning platforms and simulation-based training, to enhance student engagement and learning outcomes. This innovative approach reflects the college's commitment to providing a holistic education that prepares students to meet the evolving demands of the medical field.[5]

Clinical Training: Bridging Education and Healthcare Delivery

The hallmark of medical education is the integration of clinical training, and Netrokona Medical College excels in this domain by offering students extensive hands-on experience. The college's partnership with Netrokona Sadar Hospital, a 500-bed facility, is essential in providing real-world clinical exposure to students.[6] This collaboration allows students to apply their theoretical knowledge in a clinical environment, working alongside experienced physicians, surgeons, and specialists in a variety of medical fields. The Sadar Hospital serves as a teaching hospital where students are involved in diagnosing and treating patients under the supervision of faculty members. This setup ensures that medical students gain practical skills in patient care, diagnostic techniques, and treatment procedures, preparing them for the realities of healthcare practice.[7] Moreover, students engage in community outreach activities, participating in health camps and awareness programs that benefit local communities, particularly in rural areas. Clinical rotations at NMC focus on diverse medical specialties, ensuring that students develop a well-rounded skill set. These rotations provide exposure to critical care, surgery, pediatrics, obstetrics and gynecology, and other essential fields, ensuring students are prepared to work in various healthcare settings.[8]

Research and Innovation: Advancing Medical Knowledge

Research is a crucial component of medical advancement, and Netrokona Medical College has made strides in this area by fostering a culture of research and innovation. In 2020, the college established the *Journal of Netrokona Medical College* (JNMC), which serves as a platform for publishing research conducted by faculty and students.[9] This journal has become a key vehicle for disseminating medical knowledge, particularly in areas relevant to Bangladesh's healthcare needs. The research conducted at NMC covers a wide range of topics, with a focus on addressing the most pressing health challenges faced by the population. For example, studies on infectious diseases such as tuberculosis and malaria, common in rural Bangladesh, have been a focal point of research. Additionally, NMC has been involved in research examining maternal and child health, healthcare policy, and the impact of environmental factors on public health. By encouraging students to participate in research projects, the college is also instilling a sense of inquiry and critical thinking. Students are trained not only to consume medical knowledge but to contribute to its expansion by exploring new ideas and conducting studies that have practical applications in the local context.[10]

Community Health and Public Engagement

Netrokona Medical College's influence extends beyond the academic and clinical spheres into the realm of public health. The college is deeply committed to improving the health and well-being of local communities. Through various outreach programs, NMC has implemented health education initiatives, vaccination campaigns, and free medical camps aimed at raising awareness about prevalent health issues.[11] One of the most notable programs is the college's maternal and child health initiative, which focuses on reducing infant mortality rates and improving maternal health outcomes in rural areas. The college works closely with local government bodies and non-governmental organizations to implement these programs, ensuring that they are accessible to the most vulnerable populations. NMC also plays a crucial role in the early detection of diseases, particularly through its mobile health clinics that visit underserved areas. These clinics provide essential health services, including screenings for chronic diseases such as hypertension and diabetes, and offer follow-up care for patients who require ongoing treatment.

Overcoming Challenges: A Vision for the Future

While Netrokona Medical College has made significant strides, it faces several challenges typical of a newly established institution. Limited resources, a shortage of faculty members in specialized areas, and the need for further infrastructural development are some of the issues that the college is actively working to address. The government has pledged to support the college's growth, with plans for expanding faculty recruitment, improving infrastructure, and enhancing the research capacity of the institution. The long-term vision for NMC includes the establishment of a permanent campus in the Mauje Bali area, which will feature state-of-the-art facilities, including modern classrooms, laboratories, and specialized medical equipment.[12] This new campus will not only improve the quality of education but also enable NMC to expand its programs and offer more specialized courses in medical fields such as cardiology, oncology, and neurology.

Conclusion: Shaping the Future of Healthcare

Netrokona Medical College has quickly become a cornerstone of healthcare education and delivery in Bangladesh. Through its commitment to academic excellence, hands-on clinical training, innovative research, and community health initiatives, NMC is making a lasting impact on the healthcare landscape. By focusing on medical

education in underserved regions and fostering a spirit of innovation, the college is preparing the next generation of healthcare professionals to tackle the complex health challenges of the future. With continued investment and support, NMC has the potential to become a leader in medical education and healthcare delivery, not only in Bangladesh but in the broader South Asian region. Its contributions to the field of medicine and healthcare are already evident, and its future promises even greater achievements. As NMC continues to grow and evolve, it will undoubtedly play a crucial role in improving the health and well-being of communities across Bangladesh.

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