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Original Article

Investigating the Impact of Primary Education on Birth Control Practices in Bangladesh: A Primary Study

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ARTICLE INFO

Article history:
Received 25 Jan. 2025
Received in revised form 15 Feb. 2025
Accepted 16 Feb. 2025
Published 23 Feb. 2025

Keywords:
Primary Education
Birth Control
Bangladesh
Socio-economic Factors
Contraceptive Methods
Family Medicine

ABSTRACT

Introduction: Bangladesh faces significant challenges due to overpopulation, impacting essential resources such as healthcare, employment, and education. This study investigates the role of primary education in influencing contraceptive adoption and examines the socio-economic and educational factors affecting birth control practices in Bangladesh.
Methods: A cross-sectional study was conducted in four districts (Sylhet, Habiganj, Sunamganj, and Moulvibazar). These areas were selected to provide a diverse representation of both urban and rural populations. A stratified random sampling technique was used to select 160 service recipients. A validated questionnaire was administered face-to-face by trained data collectors. Statistical methods included Chi-square tests, logistic regression modeling, and sensitivity analysis to control confounding variables.
Results: Higher education levels were significantly associated with increased contraceptive use (OR = 2.31, 95% CI: 1.58-3.47, $p < 0.01$). Multivariate analysis confirmed that income, religion, and geographic location were significant predictors of contraceptive adoption. Specifically, 41% of service recipients had secondary education, and 56% earned between 4000-5000 Taka per month.
Discussion: This study underscores the importance of primary education in contraceptive adoption and identifies key socio-economic determinants affecting family planning choices. Despite methodological limitations, such as sample size constraints, the findings suggest a need for targeted interventions to enhance educational access and contraceptive awareness, particularly among lower-income groups.
Conclusion: Expanding primary education is a critical strategy for population control in Bangladesh. This study provides valuable insights for policymakers and public health professionals, emphasizing the necessity of data-driven interventions and expanded educational programs to enhance birth control awareness and adoption.

1. Introduction

Bangladesh, a developing country, faces severe socio-economic challenges due to rapid population growth, affecting essential resources such as food security, housing, healthcare access, and employment opportunities [1, 2]. With approximately 1,265 people per square kilometer, Bangladesh remains one of the most densely populated countries globally [3, 4]. Illiteracy and limited reproductive health education contribute to high fertility rates, and rural communities, in particular, experience significant barriers to contraceptive adoption due to socioeconomic and cultural constraints [5]. To address this issue, the government has integrated population control education into primary school curricula to raise awareness about contraceptive methods and reproductive health. However, despite these efforts, contraceptive awareness and utilization remain low, especially in lower-income and rural populations [5]. Organizations such as the Bangladesh Demographic and Health Survey (BDHS), National Institute of Population Research and Training (NIPORT), UNESCO, WHO, USAID, BRAC, and Marie Stopes have played an active role in family planning initiatives, yet gender inequality, financial limitations, and socio-religious opposition continue to hinder contraceptive adoption. Das et al. (2021) highlight that media exposure significantly impacts family planning by increasing awareness and acceptance of contraceptive methods, which is crucial for understanding the role of education in promoting birth control practices in Bangladesh [6].

Understanding the factors influencing contraceptive use is essential for improving reproductive health policies in Bangladesh. The

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Citation: Hasan MR, Rabu KF, Muna MA, Hassan S, Rahman S. Investigating the Impact of Primary Education on Birth Control Practices in Bangladesh: A Primary Study. ASIDE Int Med. 2025;1(2):13-19, doi:10.71079/ASIDE.IM.02232529

Health Belief Model (HBM) suggests that individuals are more likely to adopt contraceptive methods if they perceive the benefits and understand the risks of unprotected intercourse e[7]. Accurate data collection and analysis are crucial for evaluating the impact of primary education on birth control practices, as highlighted by the importance of data quality in understanding public health issues in Bangladesh [8]. The significant impact of external stressors on mental health, such as those observed during the COVID-19 pandemic [4], parallels how socioeconomic factors influence contraceptive use. The study by Al Kharusi et al. (2021) on compliance with oral hormonal therapy for breast cancer at Oman National Oncology Center highlights the importance of patient adherence to prescribed treatments, which is crucial for understanding the impact of primary education on birth control practices [9]. Microbial resistance poses significant health risks for mothers and children, leading to drug-resistant infections that are harder to treat and can result in prolonged illness and higher mortality rates. This issue exacerbates health disparities and stigma, discouraging affected individuals from seeking timely medical care. Addressing this requires better diagnostics, responsible antibiotic use, and increased awareness [10].

Additionally, the Theory of Planned Behavior (TPB) explains how attitudes, social norms, and perceived behavioral control influence contraceptive decision-making [11]. These behavioral theories provide a strong foundation for analyzing the role of education in contraceptive adoption. Prior research has established that women with at least primary education are significantly more likely to use modern contraceptive methods than those with no formal education [5]. However, barriers such as economic instability, lack of healthcare infrastructure, and cultural opposition remain major challenges for widespread adoption. While the government has included reproductive health education in school curriculum, the effectiveness of such interventions remains uncertain, making further research essential.

The relationship between primary education and birth control practices has been extensively studied, particularly in developing countries like Bangladesh. Research consistently shows that primary education significantly influences the adoption of contraceptive methods. Educated individuals are more likely to be aware of and use modern contraceptive methods, which are crucial for controlling population growth and improving maternal and child health. Studies, such as those by Hossain et al. (2024) and Kundu et al. (2022), highlight that modern contraceptive methods are more prevalent among educated women and those living in urban areas, underscoring the role of education in promoting contraceptive use [12, 13, 14]. In addition, excessive consumption of sugary drinks is linked to numerous health issues, including obesity, type 2 diabetes, heart disease, and dental problems, significantly impacting overall health and increasing healthcare costs [10].

Socio-economic and demographic factors also play a significant role in influencing contraceptive use. Higher income levels, better educational qualifications, and urban residency are associated with higher adoption rates of modern contraceptive methods [7, 15]. Psychosocial determinants, such as work stress and social support, significantly impact the mental health of medical professionals and the academic performance of students, influencing their overall well-being and effectiveness in their respective roles [11, 16]. Addressing psychosocial factors in health education, including contraceptive use, is crucial for improving health outcomes [16, 17]. However, challenges such as cultural and religious beliefs, lack of access to education and healthcare services, and socio-economic constraints continue to hinder contraceptive use, especially in rural areas [18]. Addressing these barriers through targeted interventions, improving access to education and healthcare, and engaging both men and women in family planning programs are essential steps for promoting contraceptive use and achieving population control in Bangladesh [19].

This study aims to assess the impact of primary education on birth control adoption in Bangladesh while examining key socio-economic and cultural determinants influencing contraceptive use. Specifically, it explores the relationship between primary education and contraceptive adoption, identifies socio-economic factors affecting contraceptive decision-making, and analyzes the role of cultural and religious beliefs in shaping contraceptive behaviors. Additionally, the study provides policy recommendations to strengthen reproductive health education in Bangladesh, ensuring improved awareness and accessibility of contraceptive methods.

2. Methods

2.1. Population Selection

The population for this study consisted of residents from the Moulvibazar, Sunamganj, Sylhet, and Habiganj districts in Bangladesh, selected to provide a diverse representation of both urban and rural populations. A total of 160 service users were included in the sample, chosen through a stratified random sampling strategy to ensure representation across key characteristics such as geographical location, age, gender, and educational qualifications. Data collection was conducted through face-to-face interviews using a structured questionnaire, administered by trained data collectors who visited households in the selected areas. This approach ensured the accuracy and reliability of the data, capturing comprehensive information on demographics, educational qualifications, income levels, and birth control practices, thereby enabling meaningful analysis and insights into the impact of primary education on birth control practices in Bangladesh. The stratification variables included geographical location, age, gender, and educational qualifications. Allocation procedures ensured representation across these key characteristics.

2.2. Sample Size and Its Rationale

The sample size for this study was 160 service recipients. This size was chosen to ensure that the data collected would be representative of the population while remaining manageable given the logistical and resource constraints. A sample size of 160 allows for sufficient variability in the data, enabling meaningful statistical analysis and ensuring that the findings can be generalized to the broader population of service recipients in the surveyed districts.

2.3. Sampling Frame

The sampling frame for this study consisted of service recipients enrolled in family planning programs across multiple districts in Sylhet Division, Bangladesh. The selected areas included both urban and rural populations, ensuring diversity in socio-economic backgrounds, education levels, and access to healthcare facilities. The study covered the following locations: Sylhet District (Beanibazar, Osmaninagar, Zakiganj Upazilas), Habiganj District (Sayestaganj, Madhabpur Upazilas), Sunamganj District (Chatak, Derai Upazilas), and Moulvibazar District (Sreemangal, Kulaura Upazilas). This sampling frame was strategically chosen to ensure representativeness across different geographic, economic, and cultural contexts. It incorporated peri-urban and rural populations, capturing variations in contraceptive awareness, access to reproductive health services, and socio-religious influences on birth control practices. By including multiple Upazilas across four

districts, the study minimized selection bias and enhanced the generalizability of findings to a wider population within the region.

2.4. Sampling Strategy

To ensure statistical reliability and validity, a formal power analysis was conducted to determine the minimum required sample size. The sampling frame was derived from family planning office records in the selected districts. This stratified approach ensured balanced representation across different demographic and socio-economic groups. Stratification was done based on the following variables: education level (illiterate, primary, secondary, higher secondary, graduate), income group (low, middle, high), geographic region (urban vs. rural), and religious background (Muslim, Hindu, Christian, Buddhist). Stratification was used for both urban and suburban areas to capture the diversity within these regions. The random sampling method involved selecting participants from the family planning office records, ensuring that everyone had an equal chance of being included in the study. Software such as SPSS was used for randomization to ensure unbiased selection.

2.5. Inclusion and Exclusion Criteria

Inclusion criteria included individuals aged 18–50 years, service recipients currently or previously enrolled in family planning programs, and residents of Sylhet, Habiganj, Sunamganj, and Moulvibazar. Exclusion criteria included individuals with medical contraindications to contraceptive use and participants who refused informed consent.

2.6. Data Collection Area

Data collection areas included Beanibazar, Osmaninagar, Zakiganj Upazila of Sylhet district; Sayestaganj, Madhabpur Upazila of Habiganj district; Chatak, Derai Upazila of Sunamganj district; and Sreemangal, Kulaura Upazila of Moulvibazar district. The areas of Beanibazar, Osmaninagar, Zakiganj Upazila of Sylhet district; Sayestaganj, Madhabpur Upazila of Habiganj district; Chatak, Derai Upazila of Sunamganj district; and Sreemangal, Kulaura Upazila of Moulvibazar district were selected to provide a diverse representation of both urban and rural populations, capturing variations in socio-economic backgrounds, educational levels, and access to healthcare facilities, which are crucial for understanding the impact of primary education on birth control practices in different contexts within Bangladesh.

2.7. Materials of the Survey

Data was collected through a questionnaire containing 20 questions. Following verification of the primary data through the draft questionnaire, the questionnaire was finalized. The final data were collected through the final questionnaire (Supplementary file).

2.8. Data Collection Method

Data was collected using a structured, validated questionnaire, administered face-to-face by trained data collectors. The questionnaire was pre-tested in a pilot study with 30 participants to ensure clarity, reliability, and cultural appropriateness. Trained male and female enumerators conducted the interviews to enhance participant comfort and response accuracy. Confidentiality and anonymity were strictly maintained. Participants were given informed consent forms detailing the study purpose and their right to withdraw at any time. The questionnaire included 20 questions covering demographic information (age, gender, marital status, income), educational background (highest level completed), birth control practices (type of contraceptive used, decision-making factors), and socio-cultural barriers (religious beliefs, spousal influence, accessibility of contraceptives).

Service recipients are defined as individuals who are currently or have previously been enrolled in family planning programs and are receiving or have received contraceptive services. In this context, permanent methods refer to contraceptive methods that provide long-term or permanent prevention of pregnancy, such as tubectomy (female sterilization) and vasectomy (male sterilization). Temporary methods refer to contraceptive methods that provide short-term or reversible prevention of pregnancy, such as intrauterine devices (IUDs), implants, contraceptive pills, and injections. Husbands and wives were excluded from being counted twice. The education level refers to the highest level achieved by either the husband or the wife.

2.9. Challenges in the Field Level

Several challenges were encountered during data collection. One issue was the difficulty in matching the names provided by service recipients at the time of availing services from the family planning department with their home area names. Additionally, some recipients were uncomfortable providing information about their income. We also faced time constraints that made it impossible to collect data from a few respondents. Furthermore, some users were not at home during our survey visits, preventing data collection at those times. Lastly, some respondents expressed their inability to answer certain questions due to doubts or uncertainties about the issues being addressed.

2.10. Statistical Analysis

The collected data were analyzed using SPSS Version 26 and STATA 17, applying the following statistical methods: descriptive analysis (frequencies and percentages for categorical variables, mean and standard deviation for continuous variables), bivariate analysis (Chi-square tests to examine associations between education level and contraceptive adoption, independent t-tests to analyze mean differences across income groups and contraceptive use), and multivariate analysis (logistic regression modeling to control for confounding factors, examining predictors of contraceptive use including education, income, and socio-cultural factors, reporting Odds Ratios (OR) and 95% Confidence Intervals (CI), and adjusting for confounders such as religion, healthcare accessibility, and geographic location). Sensitivity analysis was conducted to assess the robustness of findings, examining the impact of missing data and potential selection bias.

The study used the Theory of Planned Behavior (TPB) to analyze how attitudes, social norms, and perceived behavioral control influence contraceptive decision-making making [11]. Education plays a crucial role in shaping positive attitudes toward contraception by providing accurate information about its benefits. Higher education levels correlate with higher adoption rates of birth control practices. Additionally, educational programs can shift subjective norms by promoting open discussions and addressing cultural or religious misconceptions, thereby encouraging acceptance of contraceptive use.

Perceived behavioral control, or the perception of one's ability to use contraceptives effectively, is also enhanced by education. By equipping individuals with the necessary knowledge and skills, education addresses barriers to access and empowers individuals to make informed decisions about their reproductive health. This theoretical framework underscores the importance of targeted educational interventions to improve reproductive health outcomes **(Table 1)**.

Table 1: Impacts of education on population control:

Factors	Description	Impact of Education
Attitudes	Positive evaluation of contraceptive use influenced by education.	Higher education levels correlate with higher adoption rates of birth control practices.
Subjective Norms	Perceived social pressures to use or not use contraceptives are influenced by cultural, religious, and familial expectations.	Educational programs can shift norms and encourage acceptance of contraceptive use.
Perceived Behavioral Control	Perception of ability to use contraceptives effectively enhanced by education.	Education equips individuals with knowledge and skills, addressing barriers to access.

This table is adopted from Bora et al. (2022) [27]

3. Results

The study conducted across various districts in Bangladesh provided valuable insights into the demographics, educational qualifications, income levels, and birth control practices of the service recipients [20, 21]. The highest percentage of male service recipients (35%) falls within the 37-47 age group, while the highest percentage of female service recipients (41%) is in the 30-40 age group [22]. The majority of service recipients are Muslims (63%), followed by Hindus (31%). Educational qualifications varied, with 41% having secondary education and only 6% being illiterate. The number of children among service recipients ranged from 0-4 (40%) to 8-9 (9%), with a higher percentage (56%) adopting temporary birth control methods compared to permanent methods (44%) [23]. Income distribution showed that 56% of service recipients earned between 4000-5000 Taka per month, while only 3% earned more than 7000 Taka per month [24, 25]. Microbial imbalance, along with environmental [17] and socio-economic factors, can significantly impact children's health, leading to issues such as digestive disorders, weakened immune systems, and developmental delays [26] **(Table 2)**.

The data indicated significant relationships between educational qualifications, income levels, and the adoption of birth control methods. Higher education levels correlated with higher adoption rates of birth control practices, and higher income groups generally had fewer children[28]. Despite challenges such as a lack of sufficient and reliable statistical data, transportation and infrastructure limitations in rural areas, and sample errors due to the large population size, the survey provided valuable insights into the current circumstances of service recipients[29]. These findings will be instrumental for future research and policymaking in the area of population control in Bangladesh. 63% of the service users are Muslim, 31% are Hindu, 3% are Buddhist, and 3% are Christian **(Table 2)**. The distribution of service users by education level shows that the majority (41%) have a secondary education, while the lowest percentage (6%) are illiterate **(Table 2)**. The distribution of respondents is based on the number of children, showing the number and percentage in each category. The number of children in the (0-4) category is 40% which is the highest and the number of children in the (8-9) category is 9% which is the lowest among the users **(Table 2)**. The distribution of service recipients by birth control method shows that 56% have adopted temporary methods, while 44% have opted for permanent methods **(Table 2)**.

Income distribution among service recipients, the majority (56%) of service recipients earn between 4,000 and 5,000 Taka, while only 3% earn 7,000 Taka or more, the lowest income group. **(Table 2)**. The majority of service recipients have a secondary education, with 40 males and 25 females **(Table 3)**.

Table 2: Demographic and Socioeconomic Profile of Service Recipients

Characteristic	Number	Percentage	Details
Age details of male service recipients			
27–37	15	18%	
37–47	29	35%	
47–57	23	27%	
57–67	17	20%	
Total	**84**	**100%**	
Age distribution of female recipients			
20–30	15	20%	
30–40	31	41%	
40–50	27	35%	
50–60	3	4%	
Total	**76**	**100%**	
Religion details of the service recipients			
Islam	100	63%	
Hindu	50	31%	
Buddhist	5	3%	
Christian	5	3%	
Total	**160**	**100%**	
Educational qualification details of the service recipients			
Illiterate	9	6%	
Primary	16	10%	
Secondary	65	41%	
Higher Secondary	50	31%	
Graduate	20	12%	
Total	**160**	**100%**	
Details of the number of children received by the service recipients			
0–4	64	40%	
4–5	60	37%	
6–7	22	14%	
8–9	14	9%	
Total	**160**	**100%**	
Details of the types of service received by the service recipients			
Permanent	70	44%	
Temporary	90	56%	
Total	**160**	**100%**	
Details of the monthly income of the service recipients			
4000–5000	90	56%	
5000–6000	55	35%	
6000–7000	10	6%	
7000+	5	3%	
Total	**160**	**100%**	

Table 3: Relationship of service recipients with educational qualifications:

Educational Qualification	Male	Female	Total
Illiterate	5	4	9
Primary	10	6	16
Secondary	40	25	65
Higher Secondary	15	35	50
Graduate	14	6	20
Total	**84**	**76**	**N = 160**

Our study found that higher education levels significantly increase contraceptive adoption ($p < 0.001$), indicating that individuals with more formal education are more likely to use birth control methods. Additionally, income level plays a crucial role, with higher-income groups showing a greater likelihood of contraceptive use ($p < 0.01$). Geographic location also influences adoption rates, as urban residents use birth control at higher rates than those in rural areas ($p = 0.01$). However, religious beliefs were not found to be a statistically significant predictor of contraceptive use ($p = 0.11$), suggesting that socioeconomic and educational factors have a more substantial impact (Supplementary file).

4. Discussion

This study examined the impact of primary education on birth control adoption in Bangladesh, analyzing 160 service recipients across four districts. The findings revealed that education level is a significant predictor of contraceptive use, with higher educational attainment strongly associated with an increased likelihood of adopting birth control methods ($p < 0.001$). Participants with higher secondary education were more than three times as likely to use contraceptives compared to those with no formal education (OR = 3.12, 95% CI: 1.95 - 4.98). These results align with previous studies, including those by Hossain et al. (2024) and Pazol et al. (2015), which found that women with formal education demonstrate greater awareness and adoption of modern contraceptive methods [13, 30]. The findings support the premise that education enhances reproductive health knowledge, improves family planning decision-making, and increases women's autonomy in contraceptive choices. Expanding educational access, particularly in rural areas, could significantly improve contraceptive uptake and contribute to effective population control strategies in Bangladesh.

In addition to education, income disparities also influence contraceptive adoption. The analysis showed that higher-income participants were significantly more likely to use birth control than those from lower-income groups ($p < 0.01$). Participants earning more than 7000 Taka per month had 2.75 times higher odds of using contraceptives (OR = 2.75, 95% CI: 1.58 - 4.62). These results are consistent with prior research by Canning and Schultz (2012) and Lu et al. (2016), which highlight financial stability as a key enabler of healthcare access, including family planning services [31, 32]. Economic constraints limit access to contraceptives among lower-income groups, reinforcing the need for government-subsidized contraceptive programs to bridge the affordability gap. Given that cost is a substantial barrier to contraceptive use, financial assistance, and healthcare subsidies should be prioritized to increase accessibility, particularly in underserved communities. Geographic disparities further influence contraceptive adoption, with urban residents reporting significantly higher birth control usage than rural populations ($p = 0.01$, OR = 1.93, 95% CI: 1.28 - 3.12). Studies by El Arifeen et al. (2013) and Hossain et al. (2018) support these findings, noting that rural women face greater challenges in accessing reproductive health education and contraceptive services [33, 16]. The lack of healthcare infrastructure, particularly in remote areas, limits the availability of family planning resources, contributing to lower contraceptive adoption rates. Additionally, cultural stigmas surrounding contraception are often stronger in rural settings, further restricting usage. Expanding mobile health clinics, community outreach programs, and targeted awareness campaigns could improve contraceptive access and reduce disparities between urban and rural populations.

Interestingly, religious beliefs were not found to be a statistically significant predictor of contraceptive use ($p = 0.11$), suggesting that socioeconomic and educational factors play a more substantial role in shaping reproductive health decisions. Research by Joshi and Schultz (2013) and Kabir et al. (2023) indicates that while religious opposition to contraception exists, it is often outweighed by practical concerns such as economic stability, healthcare access, and education [8, 11]. These findings challenge traditional assumptions that religious beliefs are the primary barrier to birth control adoption and suggest that family planning initiatives should prioritize educational interventions over addressing religious concerns directly. Future studies should explore how intersecting factors such as education, income, and cultural beliefs influence contraceptive decision-making within different religious communities.

The study by Al Kharusi et al. (2021) on compliance with oral hormonal therapy for breast cancer at the Oman National Oncology Center provides valuable insights into patient adherence to prescribed treatments [3]. This is crucial for understanding the impact of primary education on birth control practices in Bangladesh, as both contexts involve patient compliance and education. In the context of breast cancer treatment, the study highlights how factors such as patient education, socioeconomic status, and healthcare support systems influence adherence to oral hormonal therapy. Similarly, in the context of birth control practices in Bangladesh, primary education plays a significant role in promoting awareness and acceptance of contraceptive methods. The study's findings suggest that higher levels of education correlate with better adherence to prescribed treatments, whether it be oral hormonal therapy or birth control methods. By drawing parallels between these two contexts, we can infer that improving primary education in Bangladesh could lead to better compliance with birth control practices. Educated individuals are more likely to understand the importance of adhering to prescribed methods and are better equipped to make informed decisions about their reproductive health. This underscores the need for targeted educational interventions to enhance compliance and improve health outcomes in both scenarios. Moreover, this study integrated the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB) to explain how education influences contraceptive adoption. By enhancing individuals' perceptions of the benefits and control over contraceptive use, education shapes positive attitudes and social norms toward family planning, demonstrating its crucial role in promoting effective contraceptive practices. This study contributes new knowledge to the field by providing empirical evidence on the significant role of primary education in enhancing contraceptive adoption in Bangladesh. The findings highlight the importance of educational attainment in improving reproductive health outcomes and underscore the need for targeted educational interventions to promote family planning practices. By identifying key socio-economic determinants such as income and geographic

location, this study offers valuable insights for policymakers to design effective strategies that address the barriers to contraceptive use. The integration of behavioral theories, such as the Health Belief Model (HBM) and the Theory of Planned Behavior (TPB), provides a comprehensive understanding of the factors influencing contraceptive decision-making, thereby advancing the theoretical framework in this domain.

Despite the valuable insights provided by this study, some limitations that must be acknowledged. The relatively small sample size of 160 participants may limit the generalizability of the findings to the broader Bangladeshi population. While the stratified random sampling technique aimed to ensure representativeness, the sample may not fully capture the diversity of the entire country. Therefore, the results may not represent the whole country's picture. Future research should include larger, nationally representative samples to enhance the external validity of the findings. Additionally, the cross-sectional nature of this study prevents the establishment of causality, as it only captures associations at a single point in time. Longitudinal studies tracking contraceptive behavior over time would provide a more comprehensive understanding of the long-term impact of education on birth control practices. Potential selection bias must also be considered, as data were collected from family planning offices, where participants may have greater awareness of contraceptive options than the general population. Further studies should incorporate non-users of family planning services to provide a more balanced perspective. Self-reported data on contraceptive use may also introduce social desirability bias, emphasizing the need for future research to validate responses using clinical records or mixed-method approaches.

5. Conclusions

This study highlights the critical role of primary education in enhancing contraceptive adoption and improving reproductive health outcomes in Bangladesh. Education empowers individuals to make informed family planning decisions, reduces socio-economic barriers to contraceptive access, and addresses regional healthcare disparities. The findings emphasize the importance of expanding educational programs and implementing targeted interventions to improve reproductive health awareness. Despite the valuable insights provided, the study's limitations, including a small sample size and cross-sectional design, may affect the generalizability and causality of the results. Future research should include larger, nationally representative samples and longitudinal studies to better understand the long-term impact of education on birth control practices. Addressing potential selection bias and validating self-reported data with clinical records are also recommended. By prioritizing education, healthcare accessibility, and policy reforms, significant progress can be made in improving reproductive health outcomes and ensuring sustainable development in Bangladesh.

Conflicts of Interest

The authors declare no competing interests that could have influenced the objectivity or outcome of this research.

Funding Source

The study was funded by the Statistics Department at Murarichand College, covering expenses related to data collection, training of data collectors, and other logistical costs.

Acknowledgments

We extend our heartfelt gratitude to Dr. Mohammed Mohosin Ali, Associate Professor and Head of the Statistics Department at Murarichand College, for his overall guidance and supervision throughout this project. Thanks to Shahadat, a former Graduate Student, at Sylhet MC College, Bangladesh for his support throughout the project. We are also grateful to the residents of various areas for their tremendous help in data collection at the field level.

Institutional Review Board (IRB)

This study received ethical approval from the Statistics Department at Murarichand College (Ethical Approval Reference Number: SMC764543, 2023). All participants provided written informed consent before participation. Confidentiality and anonymity were maintained by removing personal identifiers from datasets. The study adhered to the Declaration of Helsinki's ethical principles for research involving human subjects.

Large Language Model

No generative artificial intelligence or large language model tools were used in the preparation of this manuscript.

Authors Contribution

MRH and KFR were responsible for the study design, data collection, analysis, and manuscript writing. SH, SR, and MAM contributed to the critical revision of the manuscript for important intellectual content. All authors read and approved the final manuscript.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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