Trend and Determinants of Abortions among Adolescent Women in Rural Matlab, Bangladesh: Evidence a Prospective Cohort Study

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Abstract

Background:

Every year about 2.5 million adolescents have unsafe abortions. In Bangladesh, data on incidence of abortion suffer from under-reporting and incomplete record keeping in cases of adolescent women. So, we proposed a study to estimate level and determinants of adolescent abortions in Matlab in Bangladesh.

Methods:

This study analyzed vital events recorded by Matlab Health and Demographic Surveillance System (HDSS) from a well-defined population during 2007-2015. HDSS is operating since 1966, HDSS area was divided into two halves; icddr,b provides quality maternal and family planning (MNCH/FP) services in one half and another half receives government standard MNCH/FP services. Female community health research workers visit bi-monthly women at their home to identify pregnancy and record vital events and migration. Woman's age in most cases is known by date of birth. Study Population: Women, who had pregnancy outcomes before age of 20 years were the study population. This resulted in a final sample of 5,715 adolescent women who become pregnant between this age.

Result:

There were 5,715 adolescents in the HDSS database have complete birth form for every pregnancy outcome who become pregnant outcomes between 2007 and 2015. The adolescent abortion rates were Lower (by 18%) in ISA than GSA; higher among mothers who have primary and higher education and who are pregnant for the first time

Conclusion:

This study has estimated the first time the adolescent abortion rate in Bangladesh and reveals that MCH-FP services lower abortion rate. Reducing abortion among adolescent, post-abortion education and family planning services are needed.

Plain English Summary

Around 2.5 million adolescents have unsafe abortions each year. Abortion data in most of low- and middle-income countries including Bangladesh are under-reported and incomplete in cases of adolescent women. Thus, we proposed a study to evaluate the level and determinants of adolescent abortions in Bangladesh using Matlab data.

We analyzed vital events recorded by Matlab Health and Demographic Surveillance System (HDSS) from a well-defined population between 2007 and 2015. In 1966, HDSS established icddr,b to provide quality maternal and family planning (MNCH/FP) services in one half and to provide standardized government-

provided MNCH/FP services in the other half. Bi-monthly, women are visited by female community health workers to identify pregnancy and record vital events and migration. We analyzed 5,715 adolescent women data for this study.

The results show that the adolescent abortion rates were Lower (by 18%) in icddr,b area than government area. The abortion rate was higher among mothers who have primary and higher education and who are pregnant for the first time.

Inconclusion, this study has estimated the first time the adolescent abortion rate in Bangladesh. The prevalent groups should draw policy makers attention to reduce abortion and implement safe abortion care in Bangladesh.

Background

Adolescent childbearing has nowadays become a universal concern due to the potential impact on individual health or socio-economic consequences and also because of broader development implications. The Sustainable Development Goals (SDGs), which seek to achieve global economic, social and environmental sustainable development by 2030 will not be realized without investment in adolescent health and well-being [1] as girls aged 15–19 years contribute to 12% of global annual births and make up 10% of global annual maternal deaths. Half of all adolescent births occur in just seven countries: Bangladesh, Brazil, the Democratic Republic of the Congo, Ethiopia, India, Nigeria and the United States in 2000. Most of the adolescents stated the need to be pregnant after marriage to avoid the social stigma [2]. As compared to high- income countries, the incidence of abortion among adolescent girls is much higher in low- income countries. Consequently, every year about 2.5 million adolescents have unsafe abortions. For Africa, some 25% of all unsafe abortions occurred in this age group [3]. Unsurprisingly evidence suggest that adolescents experience higher rates of abortion-related cervical or uterine injury and more severe abortion-related complications [4–9] resulting from unsafe abortion due to their high risk for unintended pregnancies and lack of access to safe abortion services [10].

Bangladesh Demographic Health Survey (BDHS) 2017-18 (up to date) data shows that among adolescent girls, unmet need of family planning below 20 years age is 15.5% higher compare to elder age groups, age at first marriage among 15-19 years age group is 42.0%, age of first sexual intercourse among 15-19 year is 8.0%, one third of the mother among 15-19 has begun childbearing, adolescent mother married at right time is nearly one third lower than the older women(15.6%), unmet need of family planning is highest among 15-19 years age groups than others[11]. Although the Bangladesh penal code restricts abortion except to save the life of a woman, since 1979 the Government of Bangladesh has allowed Menstrual Regulation (MR) to induce menstruation and thus to return to non-pregnancy either at the time of, or within 8-10 weeks of the due date of menstruation [12]. Accurate data on the incidence of abortion in Bangladesh is not available because of under-reporting and lack of record keeping. However, a survey in 2010 found an estimated 653,000 MR procedures were performed in health facilities nationwide [13]. An additional 647,000 induced abortions were performed in the same year, the majority of which

were unsafe [13]. It is estimated that 231,400 women suffered from complications following induced abortion in 2010 [13]. In Bangladesh, 14 percent of all obstetric deaths are due to abortion complications. Reliable and robust information on abortion among adolescent women are still scarce in Bangladesh. So, we have proposed a study to document on adolescent abortion and its determinants in Matlab rural area in Bangladesh.

Methodology

Study Design:

A prospective longitudinal study, which relies on data generated by the Health and Demographic Surveillance System (HDSS) run by the International Centre for Diarrhoeal Disease Centre (icddr,b), was used to explore the determinants and compare trends of abortion among adolescent mothers in icddr,b and government service areas.

Study Population:

Women, in the HDSS database, who had pregnancy outcomes below the age of 20 years, between 2007 and 2015 were the study population. In total 5,774 adolescent mothers had pregnant outcome between age 10 and 19 years. Availability of complete data on abortion, and other relevant variables(Mother and father education, asset score, birth order etc.) were the major inclusion criteria. This resulted in a final sample of 5,715 adolescent women (3,329 in ISA; 2,386 in GSA) who become pregnant between the ages of 10 and 19. Give brief description of 59 excluded women.

Study setting:

The Health and Demographic Surveillance System (HDSS) has been running in a rural area named Matlab since 1966. icddr,b has been collecting vital statistics (live births, still births, miscarriages, deaths, marriages/dissolution and in and out migration) through community health research workers (CHRWs) since 1966 [14]. The CHRWs collect vital demographic data by visiting each household on a bi- monthly basis. At each visit CHRWs complete vital event registration forms. The Matlab HDSS area is divided into two parts as seen in Figure 1: the icddr,b service area (ISA: administrative blocks A, B, C & D) and the government service area (GSA: administrative blocks E, F & G), covering 142 villages since 1987.

In 2007, the Maternal, Neonatal and Child Health (MNCH) Project was embedded in the on-going MCH -FP Project in the icddr,b SA and has worked to increase the proportion of facility based deliveries and to introduce an evidence-based maternal & neonatal package which provides services throughout the pregnancy continuum till 6 months after delivery. [15]. In addition to documenting vital events, CHRWs in the ISA were trained to provide basic maternal health care, information on contraception and contraceptives, and immunizations for mothers and children under the MCH -FP Project. Each

administrative block in the icddr,b SA serves a population of about 27,000 and each has sub-centre hospital staffed by midwives who provide 24/7 delivery care and related services. These sub-centre hospitals are directly linked with the MCH - FP clinics in the Matlab Township, which were staffed by doctors & nurses to provide basic obstetric care round the clock [16]. In the Matlab hospital, every delivery follows standard clinical guidelines prepared by Obstetrics and Gynaecology Society of Bangladesh (OGSB) & Lamb Hospital [17].

In the GSA administrative block (E,F & G) there is a population of 115,000, and standard government services are provided. The GSA has three government Family Welfare Centres (FWCs) where a Family Welfare Visitor (FWV) is posted to serve the MNCH services to the respective population. They provide ANC, Postnatal care (PNC), delivery cares, TT injection and child vaccination. Their services are available for 24/7. If a pregnancy is complicated and out of a FWV's capacity to deal with they refer the mother to the Upazilla Health Complex (UHC) which is the nearest higher referral point for each FWC.

In both areas pregnancies are identified by pregnancy strip test with morning urine sample if women missed two menstruations consecutively.

Data collection in icddr,b service area (ISA) and Government service area (GSA):

There are two groups of CHRWs in the ISA: Surveillance CHRWs and Service CHRWs. In the ISA, both types of CHRWs are available; in the government area, only surveillance CHRWs are available. Service CHRWs collect data through monthly visits to each household. Surveillance CHRWs visit each household at a two months' interval. CHRWs collect data using a register book named the 'Service Record Book (SRB)' " and these records are collected electronically using hand-held tablets. In the ISA, CHRWs collect data on reproductive events (menstrual status, pregnancy and outcome status, lactation status, contraceptive use, under five children's diarrhoea and pneumonia history of last two weeks), the immunization status of eligible women and their under-5 children. All services provided to eligible mothers and children are recorded in a family visit record (FVR) book for every household in the ISA. In each FVR, all data are recorded for each member of the household. Each CHRW carries these electronic Tablets with her during her field visits and covers 24 households in a month and 410 couples in 18 months. During their (CHRWs) visit, if a woman is found in her missing period for - one and half months, then the CHRW performs a urine test for pregnancy and gives her a Health Service card and asks the woman to visit the sub-centre clinic (each block has one sub-centre clinic) for further care. At the sub-centre, the midwives provide a full range of services (antenatal care and postnatal care, counseling on pregnancy risks, deliveries, keeping of all records, and referral of patients to the Matlab hospital if required). Midwives are fully qualified nurses or midwives and CHRWs have at least passed class ten [14]. icddr,b has deployed 6 CHRWs for each block solely for surveillance data collection since 1966. Each CHRW completes data collection from 1200 households every two months. Economic status was measured in asset quintiles rather than in terms of income or consumption in the study area [18, 19].

Assets included durable goods (e.g., table, chair, watch, television, or bicycle), housing facilities (e.g., type of toilet, or source of drinking water), housing materials (e.g., type of wall or roof), and possession of farming land. Socio-economic survey data of year 2014 was used to construct asset quintiles.

Quality of the data:

Each CHRW area is annually assigned their service area, at the beginning of the year. Each month all CHRWs sit together, in both the icddr,b and government service areas to update their registrar books. The supervisor routinely provides spot checks of a 2% sample, on a monthly basis. After going through three tiers of supervision by Field Research Supervisors (FRSs) and Field Research Officers (FRO), and a senior manager respectively on field and then processing through an error detecting program, all cleaned data are stored within the longitudinal data system and checked with set of validation before final storage.

Data analysis:

Quantitative data was analyzed using SPSS 23 statistical software. The outcome variable was the incidence of abortion among adolescent women. Abortion was defined as termination of pregnancy before 28 weeks of gestational age for the adolescent in both areas. The independent variables covered socio-demographic and general characteristics such as maternal education, paternal education, religion, asset score, birth order, and mothers' age at first birth. Socio-demographic differences between the two service areas were measured through chi-square tests for categorical variables. Pregnancy outcome rate among adolescent women over the 9-year study period was calculated. The numerator was the total number of live births, still births, miscarriage spontaneous and miscarriage induced among female population of 10-19 years age group in each year; the denominator was the midyear female population of 10-19 years age group of the corresponding year. Similarly, abortion ratio was calculated using number of live births in the denominator whereas in the numerator the number of abortions for the corresponding year was used. Annual trends in pregnancy outcome rates and abortion ratios among adolescent women were documented from 2007 to 2015 in both areas. Further, the predictors associated with abortion were determined through binary logistic regression analysis, and adjusted for socio-demographic variables. Statistical significance was defined as p-values of <0.05.

Results

There were 5,715 adolescents (3,329 in ISA; 2,386 in GSA) in the HDSS database, who became pregnant and had outcome (live birth, still birth, miscarriage spontaneous, and miscarriage induced) between the ages of 10 and 19, between 2007 and 2015. Using the total midyear female population of 15-19 age group as the denominators in these two areas during 2007-2015 periods, the average pregnancy outcome rate was 32 per 1000 adolescent women in ISA and 23 per 1000 adolescent women in GSA, during the 9 years of study period. Throughout the study period, the annual pregnancy rates per 1000 adolescent women were higher in the ISA than in the GSA. The difference was much wider on 2010, when the annual

pregnancy rate per 1000 adolescent women was almost double in ISA (35) relative to GSA (19). However, annual pregnancy rate per 1000 adolescent women continuously increasing form 2011 till 2105 in GSA (Figure 2). The adolescents pregnancy rate were higher in years of birth, mother who have primary and higher education who are pregnant for the first time (data not shown)

The Socio-demographic characteristics of adolescent mothers are described in Table 1.

Table 1
Socio-demographic characteristics of adolescent mothers in both icddr,b service area (ISA) and Government service area (GSA)

Socio-demographic Variables	ISA	GSA	P-value
Mean birth	1.30±.747	1.28±.745	0.15
Age at First Birth (mean± SD)	18.22 ± 0.81	18.24 ± 0.79	0.132
Maternal Education			
No education	97 (2.9)	86 (3.6)	<0.001*
Primary	533 (16.0)	477 (20.0)	
Above primary	2699 (81.1)	1823 (76.4)	
Paternal Education			
No education	1437 (43.2)	1017 (42.6)	<0.001*
Primary	686 (20.6)	591 (24.8)	
Above primary	1206 (36.2)	778 (32.6)	
Religion			
Islam	2964 (89.0)	2225 (93.3)	<0.001*
Hindu	365 (11.0)	161 (6.7)	
Asset Score			
Lowest	528 (15.9)	367 (15.4)	0.219
Second	636 (19.1)	451 (18.9)	
Middle	610 (18.3)	477 (20.0)	
Fourth	739 (22.2)	557 (23.3)	
Richest	816 (24.5)	534 (22.4)	
Number of Parity			
0	441 (13.3)	284 (11.9)	<0.001*
1	2790 (83.8)	1959 (82.1)	
2+	98 (2.9)	143 (6.0)	
Birth Order			

Note: * indicates that the results are significant at P-value < 0.05

Socio-demographic Variables	ISA	GSA	P-value
1	3108 (93.4)	2208 (92.5)	0.456
2	208 (6.2)	166 (7.0)	
3	13 (0.4)	12 (0.5)	
4 or more	425 (12.8)	279 (11.7)	
Birth outcome			
Live birth	2857(85.8)	2066 (86.6)	
Still Birth	35(1.1)	38(1.6)	<0.001*
Spontaneous abortion	364(10.9)	213(8.9)	
Induced Abortion	73(2.2)	69(2.9)	
Note: * indicates that the results are significant at P-value < 0.05			

There is no difference in mean of birth adolescent pregnant women between two areas. Mean age of adolescent mothers at first birth was around 18 years in both icddr,b service area (ISA) and Government service area (GSA) for this particular study. Amongst 5,715 adolescent mothers, more than 90% had completed at least primary or higher education in both icddr,b and Government service areas whereas the percentage of father's primary and higher education level was around 56% only. In both areas, adolescent mothers are mainly Muslim and more than 80% of the adolescent mothers had a parity of 1. More than 90% of adolescent mothers in both the areas have pregnancy with first birth order. Most of the outcome of pregnancy was live birth in two areas, still birth a bit higher in government area, spontaneous abortion is higher in icddr,b area but in case of induced abortion this was higher in government area and these results were statistically significant (Table 1).

In Figure 3, the blue line shows the number of abortion per 100 LB among adolescent women in the icddr,b area where the red line indicates the Government area. It is appeared from the figure that abortion rates were higher in the icddr,b area relative to the Government area from 2008 to 2012. From 2010 to 2012 there were a decrease in abortion rates in Government areas but in icddr,b areas it continuous till 2013. After 2013 there was a huge downward pick in this rate for Government areas. In 2015, the rate was almost converged in both areas.

Table 2
Factors associated with abortion: results from bivariate and multivariate analysis

	Abortion			Adjusted Effects	
No (N=4996)	Yes (N=719)	P-value	Adjusted OR (95% CI)	P-value	
n%	n%				
Service Area					
icddr,b	2892 (86.9)	437 (13.1)	0.141	0.82 (0.71 – 0.95)	0.009*
Government	2104 (88.2)	282 (11.8)		Ref	–
Maternal Education					
No education	157 (85.8)	26 (14.2)	0.098	0.87 (0.56 – 1.34)	0.514
Primary	903 (89.4)	107 (10.6)		0.56 (0.45 – 0.71)	<0.001*
Above primary	3936 (87.0)	586 (13.0)		Ref	–
Paternal Education					
No education	2175 (88.6)	279 (11.4)	0.045*	0.55 (0.47 – 0.64)	<0.001*
Primary	1111 (87.0)	166 (13.0)		0.63 (0.52 – 0.77)	<0.001*
Above primary	1710 (86.2)	274 (13.8)		Ref	–
Mothers Age at First Birth					
<=17	1129 (83.4)	224 (16.6)	<0.001*	Ref	–
18	1486 (87.7)	208 (12.3)		0.48 (0.39 – 0.58)	<0.001*
19	2381 (89.2)	287 (10.8)		0.41 (0.34 – 0.48)	<0.001*
Religion					
Islam	4533 (87.4)	656 (12.6)	0.661	Ref	–

Note: * indicates that the results are significant at P-value < 0.05

	Abortion			Adjusted Effects	
Hindu	463 (88.0)	63 (12.0)		0.81 (0.61 – 1.08)	0.150
Asset Score					
Lowest	778 (86.9)	117 (13.1)	0.795	Ref	–
Second	948 (87.2)	139 (12.8)		0.47 (0.38 – 0.58)	<0.001*
Middle	942 (86.7)	145 (13.3)		0.48 (0.39 – 0.59)	<0.001*
Fourth	1143 (88.2)	153 (11.8)		0.40 (0.33 – 0.49)	<0.001*
Richest	1185 (87.8)	165 (12.2)		0.39 (0.32 – 0.48)	<0.001*
Birth Order					
1	4655 (87.6)	661 (12.4)	0.160	Ref	–
2	322 (86.1)	52 (13.9)		1.13 (0.83 – 1.54)	0.438
3	19 (76.0)	6 (24.0)		1.93 (0.75 – 5.00)	0.174
Note: * indicates that the results are significant at P-value < 0.05					

Table 2 shows the results from bivariate analysis to identify the determinants associated with abortion and multivariate analysis using binary logistic regression to examine the impact of icddr,b area (ISA) in decreasing the abortion ratio among adolescent mothers by adjusting the effects of other variables namely Area, Maternal Education, Paternal Education, Mothers age at first birth, Religion, Asset Score, Birth Order.

Paternal education and mothers' age at first birth were found to be significantly related to abortion as per bivariate findings. In total 719 adolescent mothers from both ISA and GSA had experienced the incidence of abortion. It is seen that percentage of mothers from ISA (13.1%) who experienced abortion was slightly higher than the mothers from GSA (11.8%). Only 23.6% of adolescent mothers with primary and above primary education have been gone through the incidence of abortion in both areas. With the increase of adolescent's age, the incident of abortion also seemed to be decreasing significantly.

Table 2 also shows that the incidence of abortion among adolescent mothers was significantly 18% lower in ISA (OR= 0.82, 95% CI: 0.71 – 0.95, p-value < 0.05) compared to that of GSA. Adolescent women having primary education (OR= 0.56, 95% CI: 0.45 – 0.71, p-value < 0.05) were less likely to experience the

incidence of abortion relative to the adolescent women who have above primary education. The incidence of abortion was found to be significantly decreased among adolescents whose husbands' have completed primary level education compared to those whose husbands have completed above primary level education. With the increase of adolescents' age at first birth, the possibility of experiencing abortion decreased in both areas. Adolescent women of age 18 years (OR= 0.48, 95% CI: 0.39 – 0.58, p-value < 0.05) and 19 years (OR= 0.41, 95% CI: 0.34 – 0.48, p-value < 0.05) had lower chance of facing the occurrence of abortion compared to adolescents whose age was less than or equal to 17 years. Asset Score was also found to be a significant determinant for experiencing the occurrence of miscarriage spontaneous. Richest adolescent women were less likely to experience the incidence of abortion (OR = 0.39, 95% CI: 0.32 – 0.48, p-value < 0.05) compared to poorest adolescent women. Similar findings had been observed for other economic classes based on asset score. The possibility of having abortion was found to be higher among adolescent women who have birth order 2 (OR = 1.13, 95% CI: 0.83 – 1.54) and 3 (OR = 1.93, 95% CI: 0.75 – 5.00) compared to those who have birth order 1; though the results were not significant for this particular study.

There were 719 abortion cases during 15 years period of the study time. Abortion (both spontaneous and induced) is overall higher in ISA area (13.1%) than GSA (11.8%). We found induced abortion is more likely to happen in GSA than ISA. We have performed logistic regression analysis adjusted with parity, year of termination, religion, distance from facility, asset score and found GSA is 1.7 times like to have an induced abortion than ISA (OR: 1.67, CI: 1.21-2.33, P<0.002) (data was not shown)

Discussion

Abortion data in developing countries including Bangladesh is of low quality and incomplete. Most of the studies reported abortion information is based on recall and suffer from social desirability bias. Maternal age can be inaccurate in survey data. Most of the reported abortion information is from different surveys that reporting respondent age and abortion information. Our study has reported surveillance data that has 60 years long duration and every birth is recorded from the day of birth. This study found adolescent abortion rate is around 11%-13% that is seems to be similar to a study conducted by BDHS 2017-18 survey data. But the definition of abortion of this study was different as this study defined abortion as "have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth" but Matlab study did not include the stillbirth. So this BDHS sub-study estimation likely to be overestimated as inbuilt nature of the definition of the abortion variables[20]. So Matlab surveillance study abortion prevalence seems accurate as this data has captured the age from the birth of the women and did not include stillbirth. The uniqueness of Matlab study is reporting abortion rate for adolescent population for the first time in the Bangladesh. We found the abortion rate is lower in GSA but occurrence of induced abortion is more likely in GSA than ISA. This could be accessibility of abortion or services in GSA is difficult than ISA. The ISA and GSA both areas provide free MNCH services but GSA providers probably put extra charges for induced abortion, so women are likely to go to the untrained providers for their easy accessibility and less cost which nearly impossible in ISA. Our study found abortion rate is little higher in ISA than GSA, it is just reversed study conducted in that area 10 years earlier [21] but induced abortion rate in GSA area is

higher like reported earlier study [21] that means that the situation for induce abortion did not change for last decade. It demands in depth exploration of abortion services in GSA area. The important determinants of adolescent abortion is parents education below primary, low economic condition and younger age which are similar with other findings [21, 22] but different with African context [10]. Our study found adolescent pregnancy rate is (29-34) which is already lower than the country SDG target that is 50 by 2030[23].

Strengths and limitations:

Data from Matlab HDSS has been criticized for not being representative of other rural areas of Bangladesh because of its many and long-term interventions in the field of health, population and nutrition [24]. One of the limitations of this data set is that it does not include never married or unmarried women. However, the data quality systems that is in place in both the ISA and GSA support and robustness of Matlab surveillance data, and is the main strength of this paper. Moreover; There are evidences that survey data may put forth the social desirability and recall bias which may produce incorrect estimation for age calculation [25-27]. So, there has ample scope to fill out this gap through long standing surveillance longitudinal data where demographic and service information are collected periodically and age is followed from birth. The rigor of the data quality procedures, long-standing follow up in nature of the HDSS has provided a unique opportunity to produce authentic results from the analysis [28].

Conclusion

This is the first study in Bangladesh which has reported adolescent abortion rate in Bangladesh. Ensuring access to youth-friendly emergency obstetric quality services along with advocacy, sexuality education, and logistical support to adolescent may be the important efforts to reduce the incidence of unsafe induced abortions as well as the complications that result from them. Induced abortion is critical health issue for adolescents as they are more vulnerable than their elder or age group. Adolescents having induced abortion need past-abortion care and appropriate family planning services. Accurate information on adolescent abortion is necessary for policy decision, action and allocate resources.

Abbreviations

ANC: Antenatal Care, BDHS: Bangladesh Demographic And Health Survey, CHRW: Community Health Research Worker, CI: Confidence Interval, CSBA: Community Skill Birth Attendant, DGFP: Director General of Family Planning, DGHS: Director General of Health Service, FHA: Female Health Assistant, FRO: Field Research Officer, FRS: Field Research Supervisor, FWA: Family Welfare Assistant, FWV: Family Welfare Visitor, GSA: Government Service Area, HDSS: Health and Demographic Surveillance System, icddr,b: International Centre for Diarrhoeal Research, Bangladesh, ISA: icddr,b Service Area, LMIC: Lower Middle Income Country, MCH-FP: Maternal and Child Health and Family Planning, MMR: Maternal Mortality

Ratio, MNCH: Maternal Neonatal and Child Health, MR: Menstrual Regulation, OGSB: Obstetrics and Gynecology Society of Bangladesh, OR: Odds Ratio, PNC: Postnatal Care, SDG: Sustainable Development Goal, SPSS: Software Package for Social Statistics, TT: Tetanus Toxoid, TFR: Total Fertility Rate, UHC: Upazila Health Complex, UHFWC: Upazila Health and Family Welfare Centre, WHO: World Health Organization,

Declarations

Ethics approval and consent to participate

The institutional review committee at icddr,b provided ethical clearance for this analysis. All participants consent were taken following icddr,b ethical policy. Data was accessed in compliance with icddr,b's published data policies. The confidentiality and obscurity of study participants was strictly maintained. Data was presented in such a way so that any individual person cannot be identified or traced back through the reported presentation of the information.

With appropriate consent form consent was collected from each participant.

Consent for publication (consent statement regarding publishing an individual's data or image):

Not Applicable

Availability of data and material (data transparency):

identifying or sensitive information from delivering women. However, "data can be available on request". The data request should be submitted to the Research Administration (RA) of icddr,b and will be assessed by the corresponding ethics committee, the Institutional Review Board of icddr,b.

Competing interests:

All the authors declared that there is no conflict of interest

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Authors' contributions:

AR conceptualized the study, designed, AR managed and analyzed the data, and interpreted the results. AR, drafted the article. AR, TB, FH, and IA reviewed, edited and updated the manuscript. All authors reviewed and approved the final version of the manuscript. The corresponding author accepts responsibility as guarantor.

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Competing Interests

The author reports no conflicts of interest in this work.

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Figures

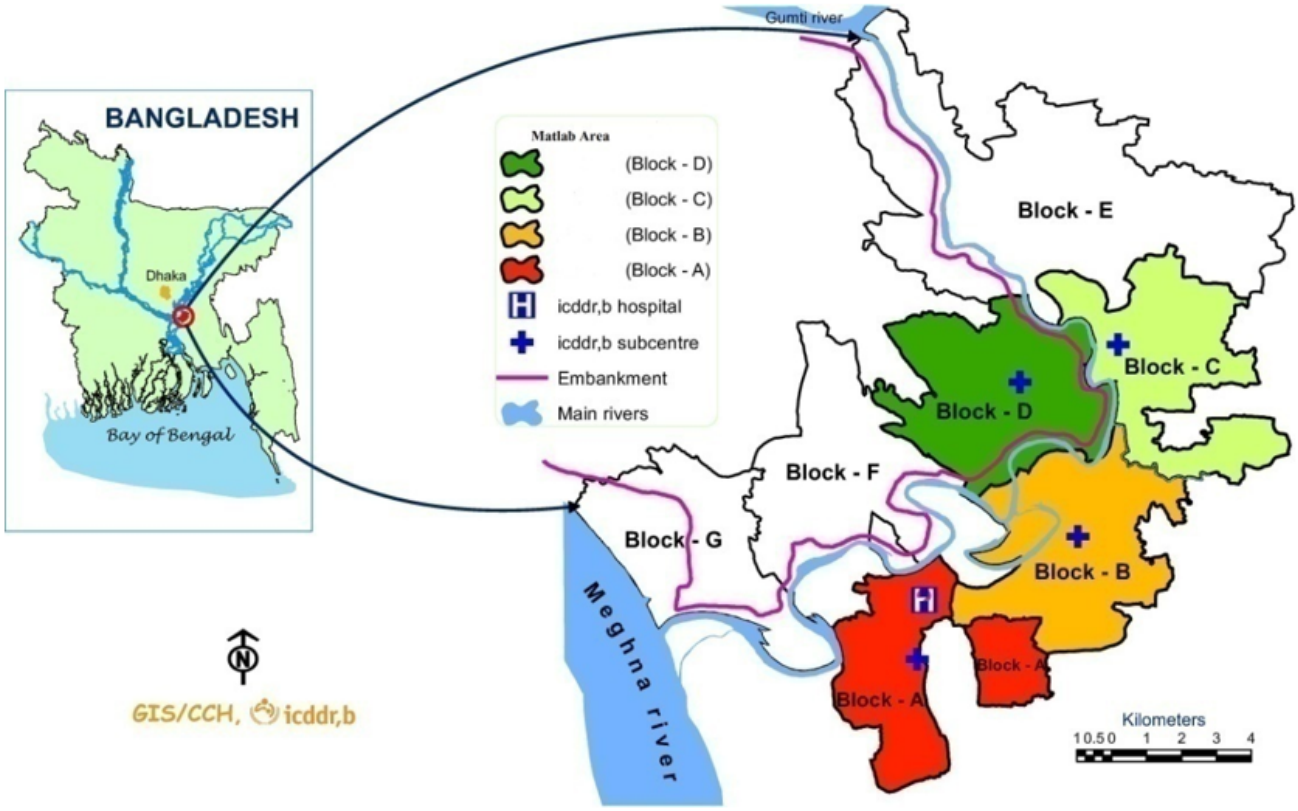

Figure 1

Matlab Study setting

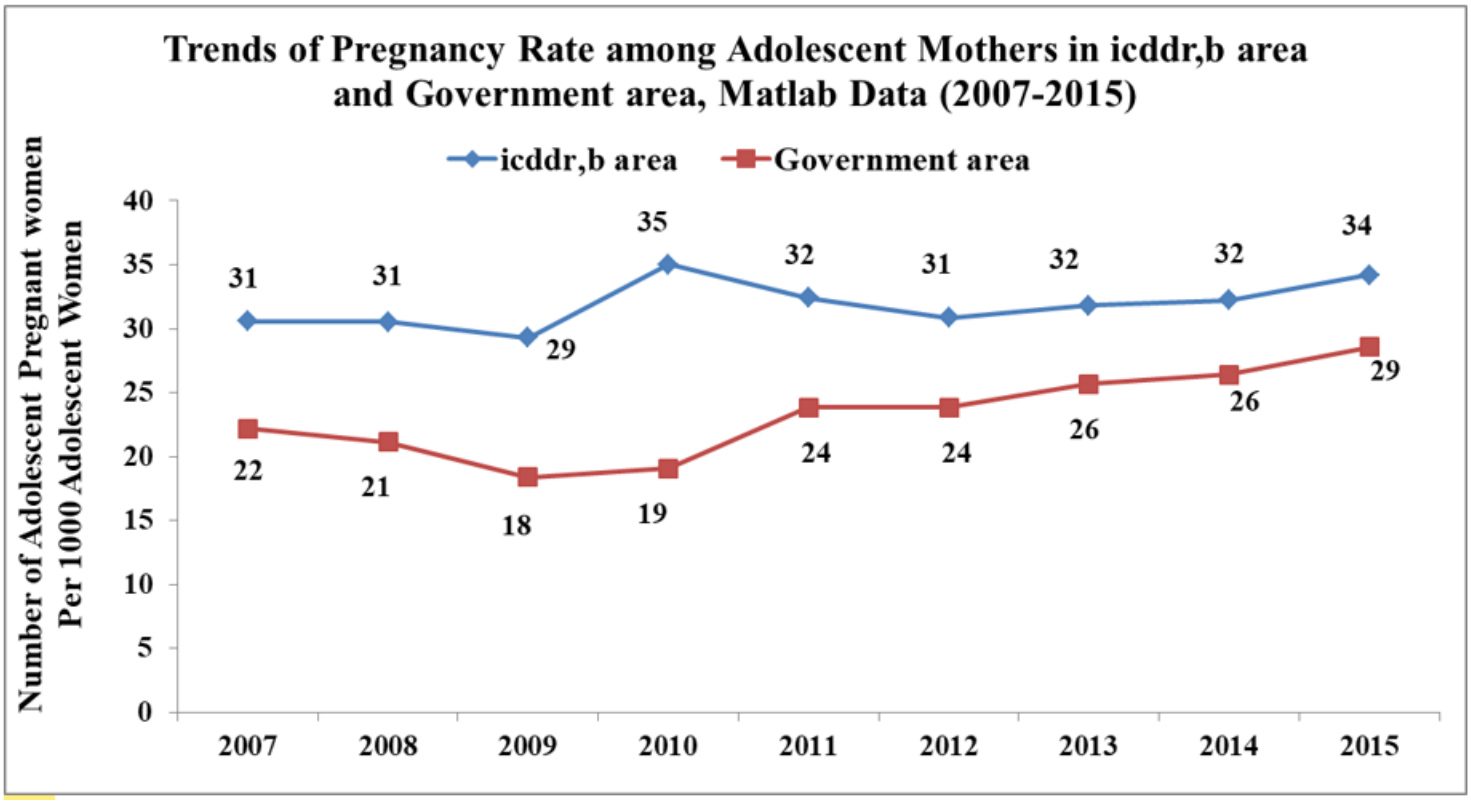

Figure 2

Trends of Adolescent Pregnancy Rates in icddr,b service area (ISA) and Government service area (GSA), Matlab Data (2007 - 2015)

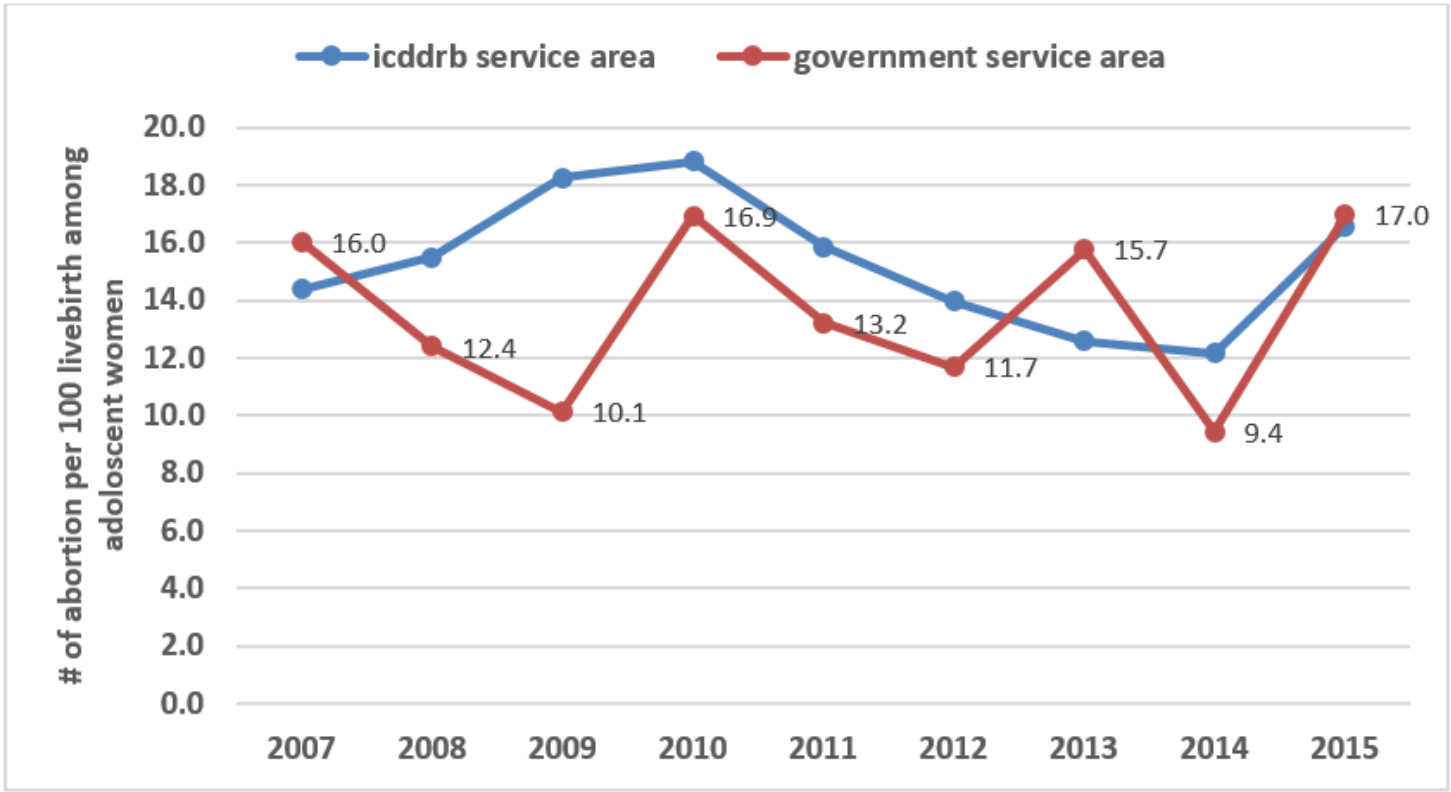

Figure 3

Abortion ratio (per 100 live births) between icddr,b area and Government area over years (2007 – 2015) among adolescent women