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Baseline sociodemographic and sexual and reproductive health characteristics of the AdSEARCH adolescent cohort study participants in rural Bangladesh: a cohort profile

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ABSTRACT

Purpose In Bangladesh, evidence on the long-term trajectory of adolescents' sexual and reproductive health (SRH) remains limited, largely due to the lack of longitudinal data to assess the changes over time. To address this gap, the Advancing Sexual and Reproductive Health and Rights (AdSEARCH) project of International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) set up an adolescent cohort study aimed at documenting changes in SRH knowledge, attitudes and practices, and identifying the factors affecting these changes. This article presents the baseline sociodemographic and SRH characteristics of this cohort as a pathway for future analyses.

Participants This cohort study included 2713 adolescents from the Baliakandi Health and Demographic Surveillance System run by icddr,b. The cohort covered three age groups from girls and boys, giving a total of five cohorts: girls aged 12, 14 and 16 years; and boys aged 14 and 16 years. A total of seven rounds of data had been collected at 4-month intervals over 2-years follow-up period.

Findings from the baseline The majority of adolescents were attending school (90%), and school dropouts were higher among boys. Around 17% of the respondents were involved in income-generating activities, which were mostly boys. Among girls, the mean age of menarche was 12.2 years. Overall, 6% of adolescents had major depressive disorder, with prevalence increasing with age. Gender differences were evident regarding knowledge about conception and contraception. Egalitarian attitudes towards social norms and gender roles were found higher among girls (52%) compared to boys (11%). The majority of adolescents reported experiencing social/verbal bullying (43%), followed by physical violence (38%) and cyberbullying (4%).

Future plans This article presents the baseline findings only. A series of papers is in the pipeline for submission to different peer-reviewed journals. The findings from this study will be used to support data-driven policy formulation for future adolescent health programmes.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The study employed simple random sampling from a well-established health and demographic surveillance system, giving the study results generalisability to the study population.
⇒ The selection of age and sex stratified samples for three age groups and following them over 2 years ensured coverage across the adolescent spectrum to observe the age-specific transitions while capturing time trend and age progression over time.
⇒ Due to the sensitive nature of some topics (violence and sexual harassment and mental health), there may be some reporting bias, and some topics (attitude towards social and gender norms, and physical activity) may be affected by social desirability bias.
⇒ The study was conducted in a rural area, which limits the generalisability of the findings to other rural and urban settings.

INTRODUCTION

Adolescence is a critical period of development between childhood and adulthood characterised by physical, psychosocial and cognitive changes that develop an individual's growth, thoughts, decision-making and social interactions.[1] This large group of adolescents has special health needs, particularly in the areas of sexual and reproductive health (SRH).[2 3] However, in low- and middle-income countries, such as Bangladesh, inadequate SRH information and services contribute to vulnerability and adverse health outcomes among both very young and older adolescents.[4] In Bangladesh, adolescents constitute 20% of the country's total population, accounting for over 34 million individuals aged 10–19 years.[5] The most significant challenges adolescents face include child

marriage, early childbearing, pregnancy complications, low use of family planning (FP) and malnutrition.[6–8] In addition, there is limited existing evidence on adolescent SRH service statistics in Bangladesh, with a lack of longitudinal data to assess the changes of health and quality of life over time. The only national survey conducted till today is the Bangladesh Adolescent Health and Well-Being Survey (BAHWS) 2019–2020, which collected information on demographic characteristics, menstruation, marriage, health and FP knowledge and utilisation, nutritional status, attitude towards gender norms, mental health and violence against adolescents and harassment.[3] Other cross-sectional studies on adolescents in Bangladesh also presented snapshots of adolescents' health status and their SRH needs but lacked longitudinal follow-up.[9–11] Evidence from the existing longitudinal studies on adolescents in Europe,[12] UK,[13] Netherlands[14] and USA[15] demonstrated that prospective longitudinal studies possess the potential for exploring adolescents' health and health-seeking behaviour, and social and individual changes over time. In South Asia, limited cohort studies have been conducted focusing on adolescent health, the majority of which were conducted in India.[16–20] In Bangladesh, there was no specific cohort study focusing on adolescents' health and well-being until recent times. Currently, an adolescent menstrual experiences and health cohort study is underway in Khulna, Bangladesh.[20]

In recent years, the Government of Bangladesh has recognised the need to address the health and SRH practice of adolescents and made provisions in the fourth Health, Population and Nutrition Sector Programme (4th HPNSP) and the National Strategy for Adolescent Health 2017–2030.[21 22] In line with these efforts, the Advancing Sexual and Reproductive Health and Rights (AdSEARCH) project, led by International Centre for Diarrhoeal Diseases Research, Bangladesh (icddr,b), aims to improve SRH outcomes and realise rights among different population groups with distinct SRH needs in Bangladesh, which includes adolescents and young people.[23] Under AdSEARCH, a cohort study was set up, including adolescents in rural Bangladesh, to find out how their SRH-related health and well-being change over time. The AdSEARCH adolescent cohort study aims to assess the SRH-related disease burden, related risk factors and health outcomes and changes over a 24-month follow-up period among adolescents in rural Bangladesh. The primary objective of this article is to present the methodology of setting up the cohort and to present the sociodemographic and some selected SRH characteristics of the study samples at the baseline, which are essential for contextualising longitudinal findings. By publishing the cohort profile, we aim to establish a clear pathway for referencing for future analyses.

COHORT DESCRIPTION

Study design and setting

The AdSEARCH adolescent cohort study is a community-based prospective study conducted in Baliakandi, a rural subdistrict of Rajbari district, Bangladesh. Baliakandi is located approximately 150-km southwest of Dhaka, the capital of Bangladesh. It is a rural setting with a population belonging to lower socioeconomic status with significant barriers in accessing healthcare, education and employment opportunities. Agriculture is the primary source of income for most households. This area has high rates of early marriage,[6] child and youth mortality.[24]

In Baliakandi, since September 2017, icddr,b has been operating a Health and Demographic Surveillance System (HDSS), which covers a population of 225 912 living in 56 800 households.[24] The Baliakandi HDSS routinely collects demographic and health information, such as marital status, religion, pregnancies and deliveries, migration and death at 3-month intervals.[24] The HDSS collects information from seven unions of Baliakandi upazila. However, this cohort study was set up in six homogeneous unions (Baharpur, Baliakandi, Islampur, Jamalpur, Narua and Nawabpur), leaving Jangal, which is characteristically different from other unions due to its lower socioeconomic progress, population composition in terms of education and religion and remote location.[25]

The adolescent cohort study has completed a total of seven 4 monthly rounds of data collection. The first round of data collection (R1), also termed as 'baseline', began in January 2023 and the last round of data collection ended in May 2025.

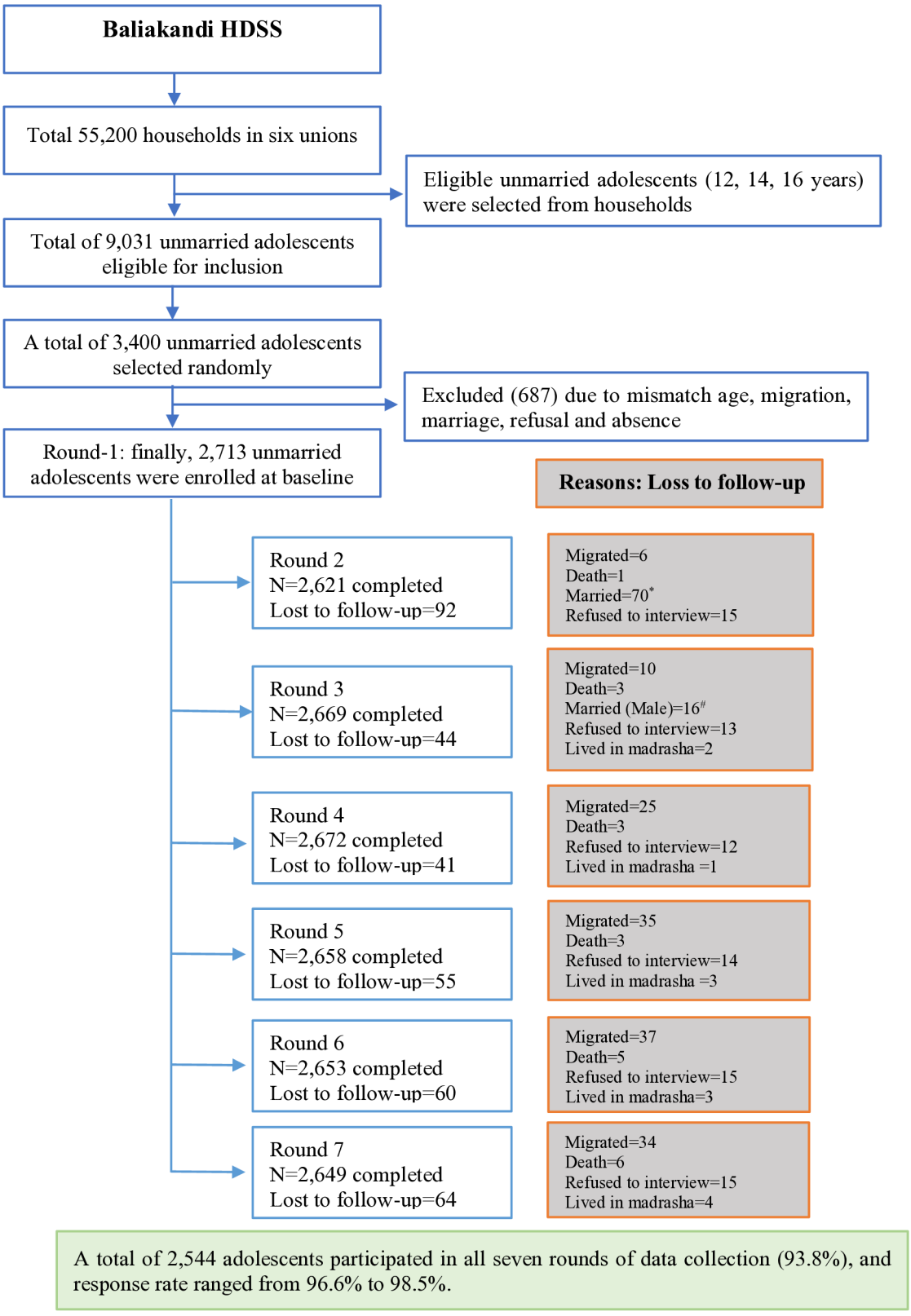
Study population

Adolescents (12–18 years) in the selected six unions in Baliakandi upazila constituted the study population. To document the experiences of adolescents from different age groups covering both very young and older adolescence, and to minimise any potential temporal effects, this cohort study included unmarried adolescents from three different age groups of 12, 14 and 16 years. A total of five cohorts of adolescents were recruited—girls aged 12, 14 and 16 years; and boys aged 14 and 16 years. Adolescents aged less than 12 years were excluded, as interviewing very young adolescents requires special attention.[26] The study included 12-years-old girls, as the mean age of menarche among Bangladeshi girls is 12.8–12.9 years.[3] However, 12-year-old boys were also excluded, as boys generally reach puberty about 2 years later than females, which also limits their exposure to sexual behaviour and knowledge.[27 28] In our study, we wanted to follow through with very young and older adolescents; thus, the selection of 12, 14 and 16, who turned 14, 16 and 18, respectively, at the end of the 2-year follow-up ensured coverage across the adolescent spectrum (12–18 years) to observe the age-specific transitions in education, employment and SRH while capturing time trend and age progression over time.

Sample selection

Sample size

We used age-wise, gender-specific prevalence of primary outcome variables (ie, menstruation, mental health, knowledge, attitude and behaviour related to sexual



***Note**: * In Round 2, we did not follow-up married female and male adolescents, # In Round 3, we did not follow-up married male adolescents.*

Figure 1 Flowchart: enrolment and follow-up of the AdSEARCH adolescent cohort. AdSEARCH, Advancing Sexual and Reproductive Health and Rights; HDSS, Health and Demographic Surveillance System.

Table 1 AdSEARCH adolescent cohort study: round-specific topics and frequency of data collection

Topics	Type of respondents; data collection round*	Description	Instruments and scoring
Data collection in 4-months interval			
Sociodemographic characteristics	B#: Age: 14 and 16 years G¥: Age: 12, 14 and 16 years R1 R2 R3 R4 R5 R6 R7	Sociodemographic information was collected on schooling, employment and number of family members. Religion, parental education and asset informations were collected from Baliakandi HDSS.	Numerical and categorical responses were recorded through semistructured questionnaire.
Menstrual problems	G: Age: 12, 14 and 16 years R1 R2 R3 R4 R5 R6 ~~R7~~	Prevalence of menstrual problems (oligomenorrhoea, dysmenorrhoea, menorrhagia and polymenorrhoea), monthly cycle tracking and health-seeking behaviour.	Numerical and categorical responses were recorded through structured questionnaires; duration was measured by day–month–year.
Mental health	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years R1 R2 R3 R4 R5 R6 ~~R7~~	Depression measured using PHQ-A (modified PHQ-9 for adolescents) was collected in R1–R4 and GAD-7 was collected in R5 and R6.[32 40]	The anxiety and depression were both measured through the cut-off points≥10 among adolescents who had moderate-to-severe disorders.
Decision-making for marriage	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years (unmarried) ~~R1~~ R2 R3 R4 R5 R6 R7	Adolescents' decisions on marriage-related information were collected on marital intention, family involvement and social and community engagement on marriage.	Categorical responses recorded.†
Fertility preference for married adolescents	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years (married) ~~R1~~ ~~R2~~ R3 R4 R5 R6 R7	Married adolescents' data on fertility preference and FP practices.	Numerical and categorical responses recorded.
Data collection in yearly intervals			
Engagement in social organisation	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years **R1** ~~R2~~ **R3** ~~R4~~ ~~R5~~ ~~R6~~ ~~R7~~	Adolescents' affiliation with any club or organisation, club names and activities. Types of clubs include local youth, scout, cultural, sports clubs and others.	Categorical response recorded; duration measured in day–month–year.
Exposure to mass media	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years R1 ~~R2~~ R3 ~~R4~~ ~~R5~~ ~~R6~~ R7	Adolescents' use of mobile phones, television, newspapers, internet and social media. Only in R7 adolescents', digital addiction was measured by DAST, which was collected.[41]	Categorical response was recorded. DAST suggested cut-off value≥30 for moderate-to-severe digital addiction of adolescents.

Continued

Table 1 Continued

Topics	Type of respondents; data collection round*	Description	Instruments and scoring
Connectedness with family and friends	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years R1 ~~R2~~ ~~R3~~ R4 ~~R5~~ ~~R6~~ R7	Information on whether adolescents can share emotions, spend time and discuss personal matters with parents, siblings, friends and others.	Categorical response was recorded.
Attitude towards social norms and gender roles‡	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years (married and unmarried) **R1** ~~R2~~ ~~R3~~ **R4** ~~R5~~ ~~R6~~ R7	Gender-based values and stereotype measures were collected from adolescents, their parents and husbands of married adolescent girls.[3]	Categorical response was recorded.
Knowledge and practice on SRH	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years **R1** **R2** **R3** ~~R4~~ **R5** ~~R6~~ ~~R7~~	Knowledge on pubertal change, conception, contraception and experience of romantic relationships among adolescents.	Categorical response was recorded.
Baseline and endline for adolescent-friendly health service intervention§	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ **R3** ~~R4~~ ~~R5~~ ~~R6~~ R7	Adolescents' healthcare service utilisation for type of services, personnel who referred, receipt of services regarding mental health, menstrual problems in the last 6 months and satisfaction after receiving services. Information on different adolescent-related programmes in schools.	Categorical response was recorded.
Violence and sexual harassment	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years **R1** ~~R2~~ ~~R3~~ R4 ~~R5~~ ~~R6~~ ~~R7~~	Adolescents' experience of violence, bullying and sexual harassment in the last 12 months was collected. The questionnaire covered types of violence and harassment, along with their perpetrator and frequency.	Categorical response was recorded.
Cross sectional (once)			
Physical activity	B: Age: 14 and16 years G: Age: 12, 14 and 16 years ~~R1~~ **R2** ~~R3~~ ~~R4~~ ~~R5~~ ~~R6~~ ~~R7~~	Information of adolescents' physical activity related to work, commute and recreation, according to WHO's GPAQ.[42]	Numerical and categorical responses were recorded, duration was measured by day–hour–minute.
Injury	All (unmarried and married) Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ **R3** ~~R4~~ ~~R5~~ ~~R6~~ ~~R7~~	Information on adolescents' injury in the last 6 months was collected. The questionnaire covered types of injury, along with frequency, place and care-seeking pattern.	Numerical and categorical responses were recorded.

Continued

Table 1 Continued

Topics	Type of respondents; data collection round*	Description	Instruments and scoring
COVID-19	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years ~~R1~~ **R2** ~~R3~~ ~~R4~~ ~~R5~~ ~~R6~~ ~~R7~~	Number of doses of COVID-19 vaccines and availability of vaccine cards among adolescents.	Numerical and categorical responses were recorded.
Vaccination HPV	G (unmarried) Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ R3 ~~R4~~ ~~R5~~ ~~R6~~ ~~R7~~	Adolescents' knowledge on HPV, availability of HPV vaccine, vaccination status and parental permission for this vaccination in rural areas.	Categorical response was recorded.
Nutrition	B: Age: 14 and 16 years G: Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ ~~R3~~ ~~R4~~ ~~R5~~ R6 ~~R7~~	Data on adolescents' nutrition were collected using dietary diversity questionnaire.[3] Anthropometric measurement data (height and weight) were collected using stature metre for height measurement tool and Tanita for weight scale. For subsample of participants', urine sample was also collected to test urinary iodine concentration.	Categorical response was recorded. Urine iodine deficiency was measured in icddr,b laboratory.
Sleeping quality	All (unmarried and married) Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ ~~R3~~ ~~R4~~ ~~R5~~ ~~R6~~ R7	The Pittsburgh sleep quality index was used to assess the sleep quality of adolescents.[43]	Categorical response was recorded, and duration of sleep was measured in day–hour–minute.
Agency (decision-making, voice and mobility)	G (unmarried and school/madrasa going) Age: 12, 14 and 16 years ~~R1~~ ~~R2~~ ~~R3~~ ~~R4~~ ~~R5~~ ~~R6~~ R7	Adolescents' participation in decision-making, their voice and mobility.[44]	Categorical response was recorded.

*4-month interval for each round data collection; #Boys; ¥Girls;
†We have also conducted qualitative interviews with selected married and unmarried participants to understand their perceptions and circumstances regarding marriage.
‡This section includes respondents and their parents (R4) and married adolescent's husband (R7).
§As part of AdSEARCH, an implementation research (IR) is also being conducted in Baliakandi upazila, the same area where the adolescent cohort study is in progress, to assess the outcomes of a multi-level holistic intervention model, including health service utilization, to promote adolescent-friendly health services. This IR's baseline and endline data are being collected through the cohort study.
AdSEARCH, Advancing Sexual and Reproductive Health and Rights; DAST, digital addiction scale for teenagers; GAD-7, generalised anxiety disorder seven-item; GPAQ, global physical activity questionnaire; HDSS, health and demographic surveillance system; HPV, human papilloma virus; icddr,b, International Centre for Diarrhoeal Disease Research, Bangladesh; IR, implementation research; PHQ, patient health questionnaire; PHQ-A, Patient Health Questionnaire for Adolescents; SRH, sexual and reproductive health.

Table 2 Sociodemographic characteristics of adolescents at baseline (round 1), n=2713.

Characteristics	All, n (%)	Girls, n (%)	Boys, n (%)
Age			
12 years	516 (19.0)	516 (31.8)	–
14 years	1120 (41.3)	569 (35.1)	551 (50.5)
16 years	1077 (39.7)	537 (33.1)	540 (49.5)
Currently schooling			
No	280 (10.3)	28 (1.7)	252 (23.1)
Yes	2433 (89.7)	1594 (98.3)	839 (76.9)
Level of education			
Primary incomplete *	258 (9.5)	99 (6.1)	159 (14.6)
Primary complete	300 (11.1)	204 (12.6)	96 (8.8)
Secondary incomplete	2088 (77.0)	1267 (78.1)	821 (75.3)
Secondary complete	66 (2.4)	52 (3.2)	14 (1.3)
Living status			
Both mother and father	2254 (83.1)	1366 (84.2)	888 (81.5)
Only mother	295 (10.9)	169 (10.4)	126 (11.6)
Only father	60 (2.2)	29 (1.8)	31 (2.8)
Neither mother nor father	103 (3.8)	58 (3.6)	45 (4.1)
Working for cash†			
No	2260 (83.3)	1516 (93.5)	744 (68.2)
Yes	453 (16.7)	106 (6.5)	347 (31.8)
Ownership of mobile phone			
No	2073 (76.4)	1520 (93.7)	553 (50.7)
Yes	640 (23.6)	102 (6.3)	538 (49.3)
Access to internet			
No	1442 (53.2)	1044 (64.4)	398 (36.5)
Yes	1271 (46.9)	578 (35.6)	693 (63.5)
Participates in any club‡			
No	2469 (91.0)	1534 (94.6)	935 (85.7)
Yes	244 (9.0)	88 (5.4)	156 (14.3)
Religion§			
Muslim	2361 (87.0)	1407 (86.7)	954 (87.4)
Hindu	352 (13.0)	215 (13.3)	137 (12.6)
Mother's education§			
No education	522 (19.2)	286 (17.6)	236 (21.6)
Primary incomplete	397 (14.6)	233 (14.4)	164 (15.0)
Primary complete	360 (13.3)	288 (14.1)	132 (12.1)
Secondary incomplete	1052 (38.8)	664 (40.9)	388 (35.6)
Secondary complete or higher	123 (4.5)	71 (4.4)	52 (4.8)
Not alive/lives elsewhere/ missing	259 (9.6)	140 (8.6)	119 (10.9)
Father's education§			
No education	930 (34.3)	536 (33.1)	394 (36.1)
Primary incomplete	409 (15.1)	244 (15.0)	165 (15.1)
Primary complete	252 (9.3)	157 (9.7)	95 (8.7)
Secondary incomplete	488 (18.0)	304 (18.7)	184 (16.9)
Secondary complete or higher	316 (11.6)	197 (12.2)	119 (10.9)
Not alive/lives elsewhere/ missing	318 (11.7)	184 (11.3)	134 (12.3)

All the results are presented in column percentages.
*Includes a few cases with no education.
†Only a few were working for products.
‡Club included local youth, scouts, cultural and sports clubs.
§Data were collected from Baliakandi HDSS.
HDSS, Health and Demographic Surveillance System.

health, attitude towards social norms and gender roles, connectedness to family and friends, and physical activity and violence) based on the available literature to calculate the sample size for the study. Since literature reporting prevalence for our specific age groups (12 years, 14 years and 16 years) was not available, we used the prevalence of 10–14 years for our very young adolescents and 15–19 years for older adolescents[3 29–35] (online supplemental material). From Baliakandi HDSS data, we found that 30% of the unmarried female adolescents aged 15–19 years get married within 2 years. Therefore, we adjusted with 30% oversampling for this age group. Based on the indicators, the highest sample size required for our study was 2464=~2500 (10–14 years (female): 500; 15–19 years (female): 1000 and 15–19 (male): 1000). Since we followed up the adolescents after recruitment for 24 months, the 14-years-old recruited adolescents transcended into older adolescents. Therefore, we considered 500 samples for very young adolescents (10–14 years) and 1000 samples for older adolescents (15–19 years)

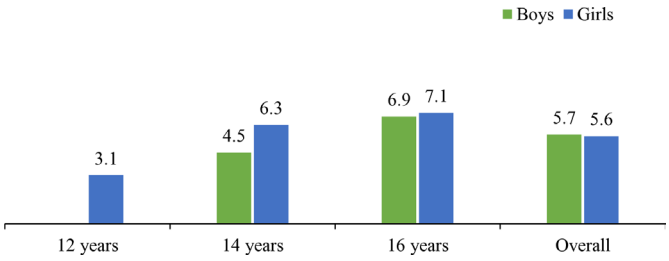


Figure 2 Percentage of adolescent boys and girls with major depressive disorder.

based on the calculated required numbers according to the indicators. The required number of samples (1000) for the older adolescence period was equally distributed between 14-years- and 16-years-old recruits. Therefore, we considered a sample size of 500 as the base sample size for each of the five age cohorts (ie, girls aged 12, 14 and 16 years; and boys aged 14 and 16 years).

Inclusion and exclusion criteria

The data collection team used the following inclusion criteria for the study: (1) unmarried adolescents aged 12, 14 and 16 years (one adolescent from each household) and (2) adolescents living in the HDSS areas who had resided there for a minimum of 6 months and would be present in this household for the next 2 years. The exclusion criteria were: (1) adolescents who experienced any significant challenges in daily life activities due to physical, intellectual and mental disabilities and (2) adolescents who were residing in hostels or boarding houses, which were confirmed by household visits.

Sampling technique

The study's sampling frame included all unmarried adolescents aged 12, 14 and 16 years residing in the Baliakandi HDSS site (N=9031). Initially, we randomly selected 3000 adolescents from the HDSS sampling frame. As we were not able to enrol the targeted 2500 samples from the list, we obtained an additional list of 400 adolescents from the sampling frame. Following the set of inclusion and exclusion criteria, from the list of 3400 adolescents, we finally enrolled 2713 participants in our study. We recruited the additional 213 adolescents over the calculated sample size, anticipating around 10% lost to follow-up during the study period. Figure 1 provides information on the number of adolescents interviewed in all rounds and reasons for lost to follow-up.

Enrolment procedures

Enrolment of adolescents

Following the sampling list, we contacted the eligible respondents at their house. Prior to enrolment, each eligible respondent and their parents/guardians were informed about study objectives, methods, timings of follow-up visits and potential risks and benefits. Enrolment proceeded only after adolescents provided their written informed assent and their father/mother/legal guardians provided written informed consent.

Enrolment of family members

The gender attitude of parents and peers might have an influence on adolescents' attitudes towards social norms and gender roles.[35 36] Therefore, we interviewed parents of the adolescents in Round 4 (R4) and married adolescents' husbands in R7 regarding their attitudes towards social norms and gender roles.

Data collection

The data collection began in January 2023. We recruited ten data collectors (six females and four males) and two supervisors with at least higher secondary education. They were young aged between 22 and 25 years, which allowed them to establish rapport with adolescents and to collect sensitive data related to SRH in a friendly manner. At the beginning of each round, data collectors and supervisors received a 5-day training on data collection tools. Most of the interviews took place at the respondents' home. Very few interviews were conducted at agricultural fields or workplaces as preferred by the respondents. Electronic tablets equipped with a native Android app were used for data collection, which were linked to a data server based at icddr,b's Dhaka office and managed by an experienced data management team.

Follow-up

This cohort study is a closed cohort. We conducted 4monthly follow-up visits and completed a total of seven rounds of data collection over the span of 24 months. If an adolescent was absent at home during a follow-up visit, we made three attempts to reach him/her through household visits. We considered a participant lost to follow-up if s/he had migrated out from the study area, refused to participate in the study or died. The response rate varied slightly between rounds and ranged from 96.6% to 98.5%. For adolescent girls who got married after enrolment, we collected additional information on FP, fertility intention and pregnancy outcomes.

Measure of outcomes

For some topics, the data were collected in every round of the study, and for others, data were collected either annually or cross sectionally. Table 1 provides the list of topics that were collected in different rounds of data collection. Before developing the questionnaire, we reviewed relevant local and global data collection tools and selected the outcomes of interest. These included BAHWS 2019, the Global Action for Measurement of Adolescent Health indicators and other relevant adolescent health measurement indicators and tools.[3 37 38]

Patient and public involvement

Participants of this study were not directly engaged in shaping the research questions or developing the research proposal or the design of the study. There was no formal involvement of patients or the public in the

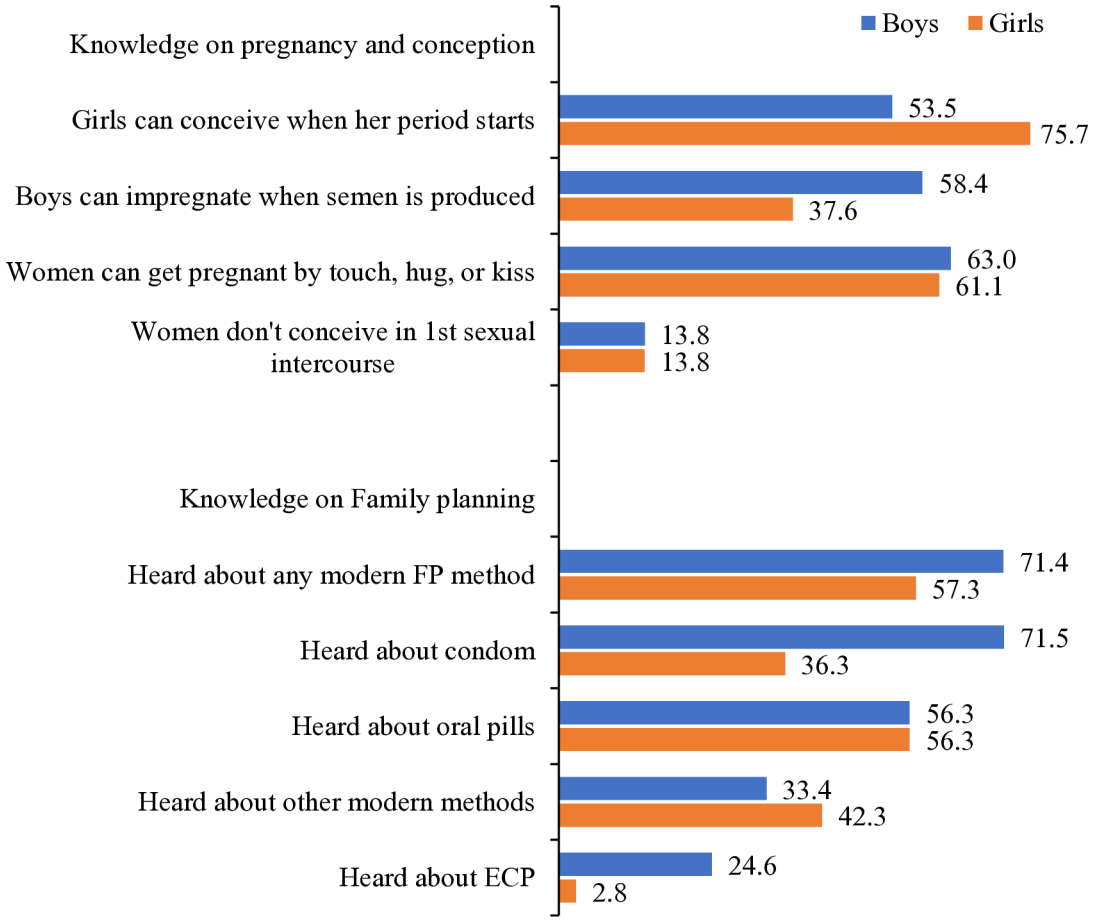


Figure 3 Percentage of adolescent boys and girls who had sexual and reproductive knowledge. ECP, emergency contraceptive pill; FP, family planning.

study process. We have no plan to disseminate the study results with the study participants. However, the study team plans to disseminate the study findings with key stakeholders, including adolescents, parents and guardians, programme and policymakers.

Findings from the baseline

We have completed data collection for seven rounds. In this article, we present summary findings of baseline data. This includes sociodemographic characteristics and some selected SRH-related information, including menstruation, mental health, sexual and reproductive knowledge, attitude towards social norms and gender roles, connectedness to family and friends, and violence.

Sociodemographic characteristics of study participants

The adolescents' sociodemographic characteristics are presented in table 2. Approximately, 10% (n=280) of adolescents were not attending school, most of them being boys. 87% of the respondents were Muslim. The majority of adolescents were living with both parents (83%), while 11% of them were living in mother-only families and 2% of them were living in father-only families. About one-thirds of the boys were working for cash, whereas the same figure was 7% for girls. Among the boys who were not in school, around 80% were working for cash. One-fourths of adolescents had their own mobile phones, while nearly half (47%) had access to the internet through their own or family members' mobile devices. Only 9% of adolescents participated in any local youth, scouts, cultural and sports clubs.

Menstruation

Almost all of the 14- and 16-year-old girls and 55% of the 12-year-old girls experienced menstruation. The mean age of menarche was 12.2 years. Use of sanitary napkins was high among the study participants (92%). Use of cloths as a menstrual product was highest among 12-year-old girls compared with other age cohorts (12 years 31% vs 14 years 24% vs 16 years 20%).

Mental health

At the baseline, overall, 6% of adolescents had major depressive disorder (a score of 10–27 in PHQ-A screener). After segregating by age and gender, a noticeable variation emerges (figure 2).

Sexual and reproductive knowledge

To assess the sexual and reproductive knowledge of adolescents, there were some statements on pregnancy and conception. Figure 3 presents the adolescents' knowledge on pregnancy and conception, where gender-based

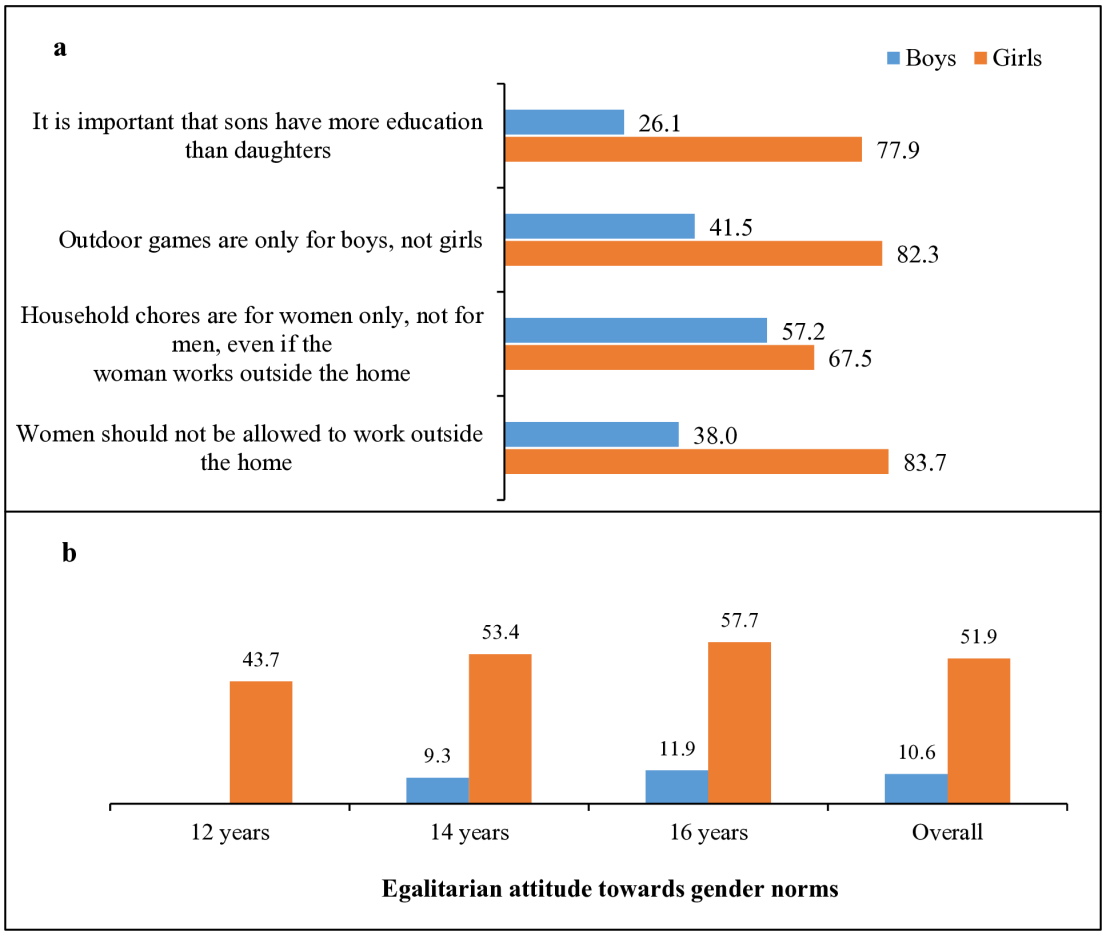


Figure 4 Percentage of adolescent boys and girls (a) disagreeing with statements on unequal gender roles and (b) having egalitarian attitudes towards gender norms.

variations were observed. We found that a higher percentage of girls than boys had correct knowledge about the statement 'Girls can conceive when first menstruation starts' (76% vs 54%, respectively). Conversely, a higher percentage of boys than girls had correct knowledge about the statement 'Boys can impregnate when semen is produced' (58% vs 38%, respectively). Regarding misconceptions about pregnancy, around two-thirds of both boys (63%) and girls (61%) correctly disagreed with the statement that pregnancy can result from touch, hugs or kisses. However, only 14% of both genders correctly rejected the misconception that pregnancy cannot occur during the first-time intercourse.

Knowledge of modern FP methods was higher among boys (71%) than girls (57%). While 72% of boys mentioned condoms, only 36% of girls reported. Emergency contraceptive pills were reported by 25% of boys but only 3% of girls.

Attitude towards social norms and gender roles

Adolescents' were considered as having an 'egalitarian' attitude towards social norms and gender roles if they disagreed with all of the four statements presented in figure 4a. For reporting of 'egalitarian' attitude towards social and gender roles, we followed a published article conducted with Bangladeshi adolescents.[39] Disagreement

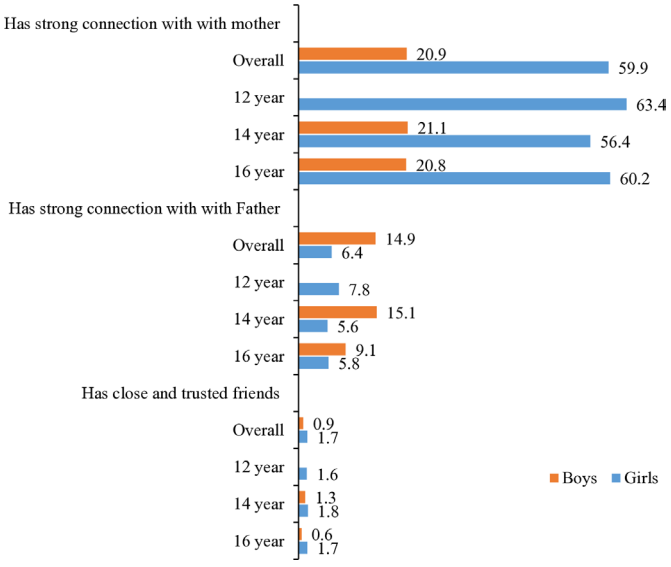


Figure 5 Percentage of adolescent boys and girls who had connectedness with mother, father and friends.

regarding the statements among girls ranged from 68% to 84%, whereas among boys, the percentages ranged from 26% to 57%.

A notable difference was seen among unmarried boys and girls regarding gender norms, with girls (52%)

having higher egalitarian attitudes than boys (11%). Age-wise differences were also high between girls and boys (figure 4b).

Connectedness to family and friends

Adolescents were reported strongly connected to their mothers/fathers if they stated that they could discuss personal matters with them 'always or most of the time'. Adolescents were considered weakly connected to their parents when they expressed that they can only 'sometimes or never' discuss personal matters with their parents.

Almost 60% of the adolescent girls reported a stronger bonding with their mother than boys (21%), and this pattern was observed in all age groups. Interestingly, the pattern was inverted when it comes to strong connection with their father. Very few adolescents reported having close and trusted friends (figure 5).

Violence

Adolescents were asked about three forms of violence experienced in the past 12 months: physical violence, verbal or social bullying and cyberbullying. Physical violence (38%) and verbal/social bullying (43%) were the most commonly reported forms, whereas cyberbullying (4%) was reported less frequently. Overall, boys reported higher levels of physical violence (46% vs 32%) and social violence (56% vs 35%) compared with girls, regardless of age, although the prevalence of both forms declined with age for both genders. In contrast, girls reported slightly higher rates of cyberbullying than boys (4% vs 3%).

Strengths and Limitations

The primary strength of this study is its longitudinal study design, which captures data on a wide range of SRH domains, and this is the first adolescent cohort study, known to us, being conducted in Bangladesh focusing on adolescents' health and well-being. The random sample selection process and the reliable tracking system supported by the Baliakandi HDSS enhance the internal validity of the study. The strong rapport established by the study's data collectors with adolescents helped to reduce response bias regarding sensitive SRH topics. We engaged male data collectors for boys and female data collectors for girls to improve data quality and better compliance from respondents.

Despite its strengths, this cohort study also has some limitations. Due to the sensitive nature of SRH topics related to GBV, menstruation, and sexual health, there was a risk that participants might provide biased responses, which can affect the accuracy of findings. Moreover, we had excluded adolescents with disabilities and those residing in hostels, which limited the evidence as to how much difference exists in their SRH knowledge compared to others. This cohort study included adolescents only from a rural area, limiting the generalisability of the findings to other rural and underserved urban adolescent populations. Moreover, the need to collect data every four months could lead to recall biases on topics such as menstrual cycles and mental health.

Future plans

This AdSEARCH adolescent cohort allows for the estimation of the incidence and prevalence of different SRH-related health outcomes of interest in relation to the adolescents' life events. Using data from this cohort, both descriptive and inferential analysis will be conducted to assess the burden, the trajectories and health-seeking behaviour of menstrual disorders; the factors influencing SRH-related knowledge and practices; the prevalence of mental health issues and associated factors; social connectedness and gender norms influence adolescents' SRH knowledge and outcomes; physical activity patterns; and dietary diversity and iodine concentration among adolescents in rural Bangladesh.

This cohort study will generate evidence to support future health interventions, decision-making and policy formulation, focusing on adolescent needs. The findings may guide healthcare providers and policymakers in developing targeted interventions to improve access to care and awareness programmes for adolescents. The data from this cohort have the potential to support the design of SRH-related education programmes, strengthen FP initiatives and help in introducing psychosocial support systems within Adolescent-Friendly Health Service Centres. The findings from this cohort may contribute to future considerations in Bangladesh National Adolescent Health Strategy and policies to improve adolescent health and well-being.

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Contributors QN, AAI, FNR, SEA, AER and AAh designed the study concept. SIS and MSR conducted the formal analysis with the help of SSS. AAI, SIS, MSR and SPS drafted the manuscript. IS supervised and coordinated data collection from the field and reviewed the manuscript. MMA, SEA, AER and AAh provided feedback. QN and AAI provided the overall supervision. All authors critically reviewed and approved the final version of this manuscript. AAI is responsible for the overall content as the guarantor.

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Patient consent for publication Consent obtained from parent(s)/guardian(s).

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