R4S Research for Scalable Solutions

Game of Choice, Not Chance

Report of the Outcome Evaluation Study for Go Nisha Go mobile app: New evidence from India

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Howard Delafield
International, LLP 1101 30th
Street NW, Suite 500
Washington, DC 20007
Phone 202-625-4364
Fax 202-625-4363
Email: susan@howard-
delafield.com www.howard-
delafield.com

Population Council Consulting
Plot 19A, Film City, First Floor,
Sector 16 A
Noida - 201301
Phone: 91 120 4610 500

https://popcouncilconsulting.com/

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Acronyms

BPL	Below Poverty Line
CTRI	Clinical Trial Registry India
DTC	Direct to Consumer
ECP	Emergency Contraception Pill
FA	Fertility Awareness
FC	Field Coordinators
FP	Family Planning
GOC	Game of Choice, Not Chance™
GNG	Go Nisha Go™
IDI	In-Depth Interview
IR	Intermediate Result
IUD	Intrauterine Device
ICMR	Indian Council of Medical Research
KAP	Knowledge Attitude Practice
MHM	Menstrual Health Management
NFHS	National Family Health Survey
OCP	Oral Contraception Pill
OE	Outcome Evaluation
PSU	Primary Sampling Unit
RCT	Randomized Control Trial
RH	Reproductive Health
SRH	Sexual and Reproductive Health
STD	Sexually Transmitted Diseases
STI	Sexually Transmitted Infections
TOC	Theory of Change

Executive Summary

Introduction

On June 29, 2022, the "Game of Choice, Not Chance™" project, led by Howard Delafield International (HDI), released "Go Nisha Go™" (GNG), an avatar-driven mobile game that engages adolescent girls in learning about matters related to sexual and reproductive health (SRH), fertility awareness (FA), and personal agency and decision-making. This innovative direct-to-consumer (DTC) mobile application was developed with financial support from USAID. GNG launched on the Google Play Store, free to download for Indian adolescents in the digital simulation game category. This report details the results and implications of an outcome evaluation study to compare indicators in SRH, MHM, and FA among participants in two study groups who received encouragement to play the game (treatment group) and who did not receive encouragement to play the game (control group).

The Outcome Evaluation (OE) of this game was conducted to determine the efficacy of the game in: a) increasing knowledge regarding specific Sexual and Reproductive Health (SRH) indicators, including fertility awareness and comprehensive contraceptive knowledge among adolescent girls; b) improving access to SRH information, products, and services through in-game Direct-to-Consumer (DTC) links; and c) supporting improved attitudes and increased confidence in decision-making and personal agency among adolescent girls.

Process

A comprehensive two-arm randomized controlled trial (RCT) was conducted, in which 1,950 female participants from ages 15-19 were recruited across three cities—Patna, Jaipur, and Delhi. A baseline survey was conducted to gather information on participants' phone usage, perceptions on decision-making, and knowledge on SRH, MHM, and FA topics. Participants were then randomly assigned into two arms: control (n=975) and treatment (n=975). The participants in the treatment arm were motivated to play all the levels of the game. This motivation was achieved through encouragement design, a series of push messages sent via WhatsApp and follow up phone calls. The push messages consisted of a series of creative visuals depicting episodes from the game, acting as teasers, encouraging the respondents to download and play all levels of the game. The study utilized an encouragement design to assess the efficacy of the game. To meet the criteria, at least 75% of the participants in the treatment group needed to complete the game. The objective was not to evaluate the game's acceptability, as the high download figures (over 300k) and game completions (35k) achieved through digital marketing were already indicative of its popularity. The control arm did not receive any of these nudges. At the end of the ten-week period, an endline follow up survey was administered to both arms (# of completed interviews: Control arm=928; treatment arm=930). This report captures the key findings

from the outcome evaluation, conducted by Population Council Consulting (PCC) from August 2022-October 2023. During this 15-month period a pilot study was conducted to test the feasibility of the encouragement-based RCT using a purposive sample of unmarried adolescents in three states of Bihar, Rajasthan, and Delhi. Two sense-making workshops were conducted to glean indicators of interest from data sets

Findings

According to the final data, in the treatment group, 859 out of 975 girls followed the protocol and downloaded the game. Out of those who downloaded, 809 played level 1, 780 played level 2, 750 played level 3, 740 played level 4, and 734 played all five game levels. The treatment diffusion was shallow. Out of 975 girls in the control group, only 22 were exposed to the game. A per-protocol analysis was done, leaving a sample size of 928 in the control arm and 769 in the treatment arm.

Analysis of baseline data revealed that three-fourths of adolescent girls were using shared mobile phones. More than half accessed the internet regularly, using social media and other mobile applications. All girls had received a formal education, and one-third enrolled in vocational courses.

Very few girls during baseline were aware of the fertile days, which typically occur midway between two menstrual periods. After the GNG intervention, a substantial number (4% to 24%) of girls from the treatment group gained awareness of the fertile days, while in the control group there was a minor shift of 3%-10%. Playing the GNG game increased awareness about menstrual products like tampons (19% to 86%), menstrual cups (22% to 88%), and reusable pads (24% to 87%). However, girls' preference for sanitary napkins as their primary menstrual hygiene product remained unchanged within the short period of assessment between baseline and follow-up (three months from baseline).

The treatment group reported significant improvement in awareness of modern reversible contraceptive methods, (highest net effect[1] of 22.5% was reported for the oral contraceptive pill). Awareness of OCP for the treatment arm changed by 24pp and 2pp for the control arm. Girls in the treatment group exhibited a significantly higher likelihood of believing in their ability to refuse sexual activity and possessing knowledge about the effectiveness of condoms in preventing sexually transmitted diseases (STDs).

Findings indicated that girls in the treatment group were more inclined to engage in negotiations and conversations with their parents related to their education, careers, and selecting a life partner. Notably, there was a significant improvement in agency among girls in the treatment group than among the control group around attitudes regarding consent,

[1] Net effect = Shift in the treatment arm [endline value - baseline value] -Shift in the control arm [endline value - baseline value]

autonomy in life decisions, and ability to assert themselves with a confident 'No' in situations related to physical intimacy. The evaluation further revealed a significant increase among girls in the treatment group in confidence to decline sexual acts if they wished, compared to girls in the control group. There was a considerable percentage growth in awareness of women's helpline numbers, complaint cell numbers for reporting violence against women, the legal age for consensual sex, and awareness of legal protections for women and children.

Throughout the implementation of the RCT, some noticeable challenges were encountered by both the program facilitators and the field investigators. Due to the school timings and board examination, field investigators conducted interviews in early morning and evening hours as per convenience of the participants. Further, the game has linkages at all levels for providing detailed information on menstrual hygiene products, fertility awareness, menstrual period tracking, legal measures, helpline numbers, etc. These features seem to have resulted in slow progression in gameplay for few participants, and few couldn't come back to the main game. The participants stated that the GNG app consumed significant space on their devices.

Conclusion

The game intervention achieved targets of improving: 1) knowledge of FP/RH care such as fertility awareness and comprehensive knowledge of contraception, 2) attitudes and confidence in decision-making for contraceptive use and accessing DTC products and information, and 3) assertion of self-identity and self-efficacy. Girls who played the game expressed greater willingness to negotiate for life decisions compared to girls who did not play the game. Results of this OE provide support for the use of similar games to promote health and wellbeing by providing DTC resources in accessible platforms.

Chapter 1: Background

1.1 Introduction

The Game of Choice Not Chance (GOC) is a direct-to-consumer (DTC) initiative that develops digital mobile games that encourage discovery and play to improve decision-making agency for sexual and reproductive health among adolescents. GOC is developed by Howard Delafield International with support from USAID. Go Nisha Go (GNG) is the first of a suite of mobile games to reach the adolescent population in India, and was launched on Google Play store in June 2022, providing adolescent girls a safe space for exploration, discovery, and learning through interactive role-play in a virtual world.

The game was developed based on underlying theoretical frameworks, including game-based learning, social learning theory, motivational theory of role-modeling, and DTC approaches. The theory of change (TC) hypothesis that underlies this project is as follows:

> If girls experience outcomes of their avatars' choices on health and agency building through a game with immersive engagement, challenge, and fun, nudging her to access relevant information, products, and services directly, then girls will learn to gain and apply knowledge related to SRH, relationships, and life decisions.

GNG uses discovery and play to empower girls to become active decision-makers. The five episodes of the game cover core concepts: menstrual health management (MHM), negotiation skills, fertility awareness (FA), consent and contraception, and negotiation for life decisions. GNG advances and supports healthy SRH and decision-making behaviors by improving attitudes and confidence for managing self-care and negotiating relationships.

1.2 About Go Nisha Go

The game follows Nisha, an 18-year-old girl living in Delhi, who sets out on a journey of self-discovery and self-efficacy. She qualifies for an internship where she produces a web series on travel and health and has opportunities to travel through a series of Indian cities, including Goa, Mumbai, Hyderabad, and Sikkim, meeting inspirational women (a scientist, an influencer, a health professional, and a police officer) along with her mentor, Dr. Paro (who hired Nisha for the internship). Each level focuses on specific game-based objectives, focusing on menstrual knowledge, fertility awareness, contraceptive knowledge, negotiation skills, and self-efficacy. The game is designed to increase knowledge incrementally (and subsequently the confidence to make choices) through strategically

placed 'nudges' in the gameplay, trade-offs/rewards, minigames, and access to resources such as educational videos and a chatbot. Players are presented with a series of choices in the game that translate to points to enhance her 'vitals', namely: physical health, relationship health, and confidence. These scores are aggregated to provide a personality prediction about the 'future' choices of the player, based on choices made within the game. Users can replay the game multiple times, exploring different outcomes and learning from simulated outcomes of their new choices. Girls gain direct access to SRH information, products, skill training, and opportunities for services through links within the game, and through a linked website where they can further explore topics related to SRH, FA, MHM, career advice, and negotiation skills.

1.3 Objectives of Outcome Evaluation

The OE measured the following Intermediate Results (IRs) from the GOC project:

IR1: Improved knowledge about Family Planning (FP)/Reproductive Health (RH) care, including menstruation, menstrual hygiene, fertility period, and FP/RH/menstrual management products.

IR2: Improved attitudes, confidence, decision-making, support, self-care, and knowledge about 1) consensual sex and contraceptive use and 2) accessing and using direct-to-consumer (DTC) products and related information and care.

IR3: Improved assertion of self-identity and self-efficacy, fostered by information and resources received through DTC linkages to career, safety, personal well-being, and FP/RH information and products.

1.4. Report Structure

This report is divided into seven chapters. Chapter 2 describes the OE methodology, including study design and analysis. Chapter 3 describes the demographics and characteristics of the respondents as recorded from the baseline survey. Chapters 4-6 compare baseline and follow-up survey responses between girls in the treatment group and the control group. Chapter 4 centers on responses related to girls' awareness and practice of menstrual hygiene and products, menstrual tracking, health-seeking for menstrual-related issues, fertility, and attitudes and beliefs towards menstrual myths. Chapter 5 focuses on awareness and comprehensive knowledge of various reversible contraceptive methods and contraceptive self-efficacy. Chapter 6 describes results related to girls' aspirations, agency, and negotiation in matters related to their academics, careers, and

marriage. This chapter also presents results on girls' understanding of consent during sexual activity, women's safety, and legal matters. The final chapter discusses girls' awareness and experience within the treatment group, including the intervention and encouragement activities.

Chapter 2: Methodology

2.1. Context

A design-led TOC framework (Shankar et al., 2023) was developed for the game which outlined the role of multidisciplinary theoretical frameworks in designing a robust evaluation strategy to measure game outcomes. The purpose of the outcome evaluation was to validate the proof-of-concept game prototype, aiming to identify potential outcomes of the game as encountered by end users (adolescent girls). Four central pathways shape a players' journey towards agency and decision making that serve as milestones in the game's theory of TOC, namely, Discover, Play, Decide, and Act. These pathways to change are built upon three guiding principles: Evidence (theoretical models and formative research (Raj et al., 2023) that informed game design), Engagement (in-game mechanics, gameplay elements, and partnerships with products, services, and information providers that served as nudges for decision making), and Evaluation (validating selected outcomes of the impact causal pathways based on the hypothesis). In the game, there are multiple pathways of outcomes leading to impact based on decisions made by the player in the game. Thus, the TOC framework, combined with a tailored impact pathway, facilitates the evaluation of the impact of the interventions provided in the game (i.e. information and resources provided). This chapter provides the detailed methodology used for the OE.

This study consists of two phases, a pilot phase (Saha et al., 2023) and a subsequent OE phase conducted across three study sites (Patna, Jaipur, and Delhi-NCR). The OE includes a two-armed RCT consisting of a baseline survey with participants in both the treatment and control groups conducted from January through February 2023, followed by three months implementation of the randomized encouragement intervention with participants in the treatment group to promote playing GNG. The follow-up survey with participants in both the treatment and control groups was conducted through June and July 2023 following the intervention phase. Participants were recruited through home visits at their households during baseline and follow-up surveys.

The intervention provided a ten-week encouragement design in which girls in the treatment group were motivated to adopt and play GNG, with support from program facilitators. A person other than the field investigator was appointed to continue the

encouragement activity in the treatment arm. The encouragement design consisted of girls receiving phone calls and structured WhatsApp multimedia messages, which acted as teasers for subsequent levels of the game and encouraged girls to play all five levels of GNG. The role of program facilitators was also to troubleshoot any technical difficulties. These phone calls and messages were tailored to match participant's progress. The aim of the first call was to establish a rapport with the participant and mutually decide a time for a follow-up call (The detailed roster of calls/messages is in Annexure 1). Apart from the nudges, the treatment group received a token of appreciation for playing through the game, which included a "certificate of participation" and sanitary pads. This was in addition to incentives given to all research participants in the form of mobile recharge coupons.

2.2 Study Design: Pilot Phase

Pilot Phase
Participants were recruited by partnering with the following organizations: Gram Swarajya Samiti Ghoshi in Patna, DIEU International Pvt. Ltd. in Jaipur and IWRS Pvt. Ltd., in Delhi, who contacted girls in the target demographic range for participation in the survey. In preparation for the RCT study, four recruitment strategies were pre-tested:

1. Recruitment for in-person surveys: 40 girls were recruited in each study site (Patna, Jaipur, Delhi NCR; 120 total)

2. Recruitment for telephonic surveys: 20 girls were recruited in each study site (Patna, Jaipur, Delhi NCR; 60 total)

3. Recruitment for online self-administered surveys: 20 girls were recruited in each study site (Patna, Jaipur, Delhi NCR; 60 total)

4. Recruitment for qualitative In-depth Interviews: 10 girls were recruited in each study site (Patna, Jaipur, Delhi NCR; 30 total)

Pre-testing examined the feasibility of the various methods and determined that the response rate of in-person interviews (face-to-face) was higher than the other two modes (telephone and online survey). Refusal to take interviews over the telephone was considerably high. Participants requested that the interviewers visit their houses and conduct face-to-face interviews. In online self-administered interviews, the girls frequently opted out, saying they were uncomfortable sharing personal information online. The in-person qualitative interviews were administered smoothly without any significant challenges. This method was selected for the RTC surveys. All interviews were conducted in a confidential and comfortable space in the participant's household or community space, after obtaining their consent to participate in the study.

Creative messages were also pretested for the encouragement, and it was determined that additional creative messages were needed to motivate participants to not only download the game, but also play all five levels. The RCT was conducted after school examination times to avoid interfering with participant recruitment.

Additionally, to ensure comparison with outcome evaluation data and in-game metrics, participants downloaded a unique six-digit profile code that was generated at the start of gameplay. The profile code from the participant determined how data from the OE could be matched with the in-game choices of the same player.

2.3 Study Design: Main Phase

The insights from the pilot phase guided the development of the OE of GNG. The sample size was 1,950 (650 adolescent girls per city). The calculation for the needed sample size was based on the statistical power required to detect changes in responses related to awareness of contraceptive methods, menstrual hygiene, and fertility (Table 1). Baseline data for awareness of these topics among unmarried adolescent girls in urban and peri-urban areas in India was gathered from the National Family Health Survey (NFHS-5) (NFHS 2019-2021). The detailed table on sample size calculation is provided in Annex 2.

Table 1 Sample size calculation for outcome evaluation study

Indicator	p1	p2	Power	Detect change	Lost to follow-up	Sample size	Per city
Contraceptive knowledge*	55%	62%	80%	7%	30%	1950	650
Fertility awareness**	11%	16%	80%	5%	30%	1950	650
Menstrual knowledge***	78%	84%	80%	6%	30%	1950	650

*Awareness of modern spacing contraceptive methods (IUD, Pill, Condom) according to NFHS-5 among unmarried adolescent girls in urban areas,

**Fertility awareness (Knowledge of the ovulatory cycle) according to NFHS-5 among unmarried adolescent girls in urban areas,

***Menstrual hygiene awareness (using sanitary napkins) according to NFHS-5 among unmarried adolescent girls in urban areas.

Trained enumerators conducted in-person eligibility screenings with prospective participants. The enumerators did households listing of the selected geographies to determine whether any eligible respondents (girls of 15 to 19 years, ability to read Hinglish, and having access to Android phone with internet) were present in the selected geographic locations. The household listing served as a sampling frame in the administrative wards. The field team then approached potentially eligible respondents and their parents to conduct the consent procedure prior to recruiting them for the study.

Overall, the study recruited 1,993 girls from three sites: Patna (n=669), Jaipur (n=658), and Delhi NCR (n=666) for the research. A baseline survey was conducted using a pre-tested structured tool. Following the baseline, participants were randomized and assigned to the control and treatment group with a 1:1 ratio. Randomization was done on an individual level. We examined the socio-demographic characteristics of both groups for equal distribution. After preparing the eligible list of participants, the randomization took place through a system-generated procedure. After consent and assent procedures with participants and parents of participants under age 18 were conducted, the participants were randomized to one of the two groups. In the treatment group, participants received encouragement to adopt the game, whereas, in the control group, participants did not receive any nudges to download or play the game.

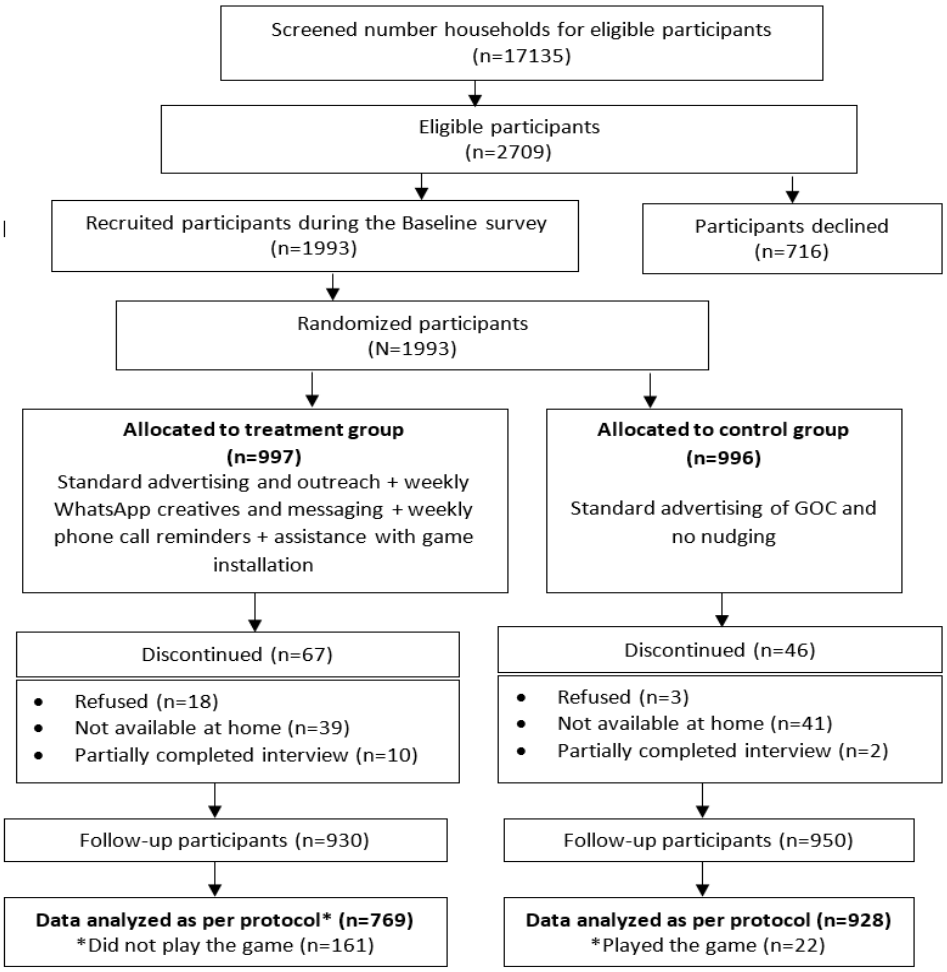
Treatment arm total participants (n= 997) from Patna (n=333), Jaipur (n=325), and Delhi (n=339) received nudges to play GNG During a ten-week encouragement intervention. The encouragement intervention was a series of push messages sent via WhatsApp and follow up phone calls. The push messages consisted of a series of creative visuals depicting episodes from the game, encouraging the respondents to download and play all levels of the game. The control arm did not receive any of these nudges.

Interviewers were able to follow up with 94% of the study participants (1,880/1,993 interviewed at baseline). Qualitative in-depth interviews (IDI) were conducted with participants from all study locations and were administered to 60 participants (20 from each location) after completion of the follow-up survey.

The IDIs aimed to: a) Gain a better understanding of the SRH environment for adolescents, including established gender norms, expectations around relationships, intimacy between adolescent girls and boys, and attitudes towards sex, marriage, and girl's health - including menstruation, fertility awareness, and contraception; b) Visualize the level of access and availability of menstrual and contraceptive knowledge, information, products, and services through the DTC approach; and c) Evaluate the agency and level of confidence for intended behaviors related to improved SRH outcomes, such as decision-making, consent, and negotiation for delaying early marriage and pregnancy.

The participants of the qualitative sub-sample were selected from Primary Sampling Units (PSUs) of the three locations. A primary sampling unit was the Census Enumeration Block (CEB) in an administrative ward of a city, that was randomly selected in a ward. Participants from the treatment group who had played all five levels of the game were selected for qualitative interviews to understand their learning and gameplay experiences.

Figure 2.1: Consort diagram for the two-arm study for the GNG outcome evaluation



2.4 Training Field Investigators

Experienced field investigators were trained to use the household listing app-based data entry tool to conduct interviews and make entries for all three study sites. The investigators were trained centrally in an in-person training conducted in Delhi (NCR). The household listing operation involved three main steps: locating each PSU, preparing the location and sketching maps of each PSU, and listing all households found in each PSU. Field Coordinators (FC) were recruited and trained to guide the household listing operation,

monitor and smooth field movement, hold community meetings, and gain consent of parents and guardians for the study. Similarly, during the follow-up survey, 2-day training sessions were conducted in specific locations, in presence of HDI team members.

2.5. Clinical Trial Registration

The OE RCT study was registered under the Clinical Trial Registry India, ICMR (Indian Council of Medical Research). The trial registration number is ctri.nic.in: CTRI/2023/03/050447

2.6. Survey tool, in-depth guide, and consent form

Learning from pre-testing tools in the pilot phase, a new survey tool was developed and used in both baseline and follow-up surveys. An additional section (9) was added to understand the game intervention and was administered only to the treatment group during the follow-up survey. Simultaneously, an in-depth qualitative guide was developed to assess how the GNG intervention related to participant's increased knowledge, improved attitude and practice in the spectrum of menstruation, contraception, and exercising agency. All study participants consented or assented to taking part in the interview process. Informed consent forms were administered for participants 18 to 19 years, assent forms were administered for participants 15 to 17 years, and parents/guardians consented to the girls' participation. The OE survey tool comprised nine sections, starting with participants' background characteristics, consumption of media via Android devices, health-seeking behavior, and career aspirations.

2.7. Key indicators

The primary purpose of the OE was to measure shifts in knowledge of MHM, FA, SRH, and life skills. among the participants. The key outcome indicators are listed below.

1. Improved knowledge about SRH care, including menstruation, menstrual hygiene, fertility awareness, and SRH/menstrual management products.
    - Awareness of menstrual hygiene products
    - Use of menstrual hygiene products
    - Practice mobile app tracking of their menstruation
    - Attitude on menstrual perception
    - Fertility awareness

2. Improved attitudes, confidence, and decision support for managing self-care, SRH, negotiating consent in contraceptive use, self-efficacy, and accessing/using DTC information, products, and care.
    - Awareness of modern reversible contraception methods

- In-depth knowledge of modern reversible contraception methods
- Negotiation and consent
  - Feel confident to say no to a sexual act to partner
  - Think they can refuse to have sex with their partner next time after having had sex previously *(Ability to refuse sex)*
  - Feel confident to negotiate condom use when their partner is not willing to (negotiation on contraception choice)
  - Think girls can change their minds anytime about touching, kissing, and sex,
  - Think their partner should always take consent for touching, kissing, and sex
- Seek health advice online

3. Improved assertion of self-identity through DTC linkages to career, safety, and personal well-being resources

   - Negotiation with parents about life choices
     - Willingness talk to their parents about clothing choices
     - Can talk to their parents about delaying or negotiating marriage timing and partners.
   - Awareness about consensual sex, POCSO Act[2], and helpline numbers
   - Awareness about career pathways - CVs and internships

2.8. Data Analysis

Quantitative analysis

Quantitative analyses were used to test whether participants who received encouragement to play the game (treatment group) expressed greater improvement in the outcome indicators (listed above) compared to the control group who did not receive encouragement to play the game. As mentioned in the consort diagram (Figure 2.1) 769 girls from the treatment group and 928 girls from the control group were included in the final analysis. The study achieved a follow-up rate of 95%, significantly higher than the initially expected rate of 70%. Therefore, no data imputation was done for participants who were lost to follow-up.

We analyzed the data using two strategies: (1) Intent to-treat and (2) per-Protocol approaches. The per-Protocol approach was chosen to present in the main report for key findings, given the criteria for participation to adhere to the study protocol of playing game

[2] The Protection of Children from Sexual Offences (POCSO) Act, enacted by the Government of India in 2012, is a law that aims to safeguard children from sexual abuses and offenses. It defines a "child" as any person under the age of 18.

versus not. For the per-protocol approach, we achieved more than the required 70% follow-up rate per group (intervention group follow-up rate in accordance with the intervention adherence: 77%; control group follow-up rate: 94%).

The results from intent-to-treat analysis are included in Annexure 4 A. The use of ITT (which ignores the protocol adherence) reduced the effect size only marginally (in comparison to per-protocol approach) but has not lost the statistical significance around the intervention effect.

Statistical methods

The quantitative study data was analyzed using STATA15 software. Both univariate and bivariate analyses were conducted for each outcome indicator. Univariate descriptive analysis was used to determine the distribution of the girls recruited for the treatment and control groups. Chi-Square (χ^2) was used to examine the homogeneity of the distribution of girls in both groups. T-test was applied to determine the change in various outcome variables. Bi-variate analysis was used to understand the prevalence of various indicators within the study groups. The net change in the outcome indicators and its significance was calculated using difference-in-difference (DID[3,4]) analysis[5]. Adjusted and unadjusted DID analyses were conducted to understand the impact of the GNG game. Adjusted DID analysis controlled for sociodemographic background characteristics such as respondent's age and education, mother's education, religion, ethnicity, and Below Poverty Line (BPL) status. Additionally, multivariable analysis models for repeated measures, such as the generalized estimating equation (GEE[6]), were used to understand the program impact on selected outcome variables. GEE is the advanced statistical technique for non-normal data that accounts for correlations between binary outcomes across time within the same individual.

Random effects panel regressions analysis was used to examine the effect of GNG on menstrual attitude index among the girls. The menstrual attitude index is constructed on the ten menstrual attitudes questions asked in the baseline and repeated in the follow-up

[3] Dimick JB, Ryan AM. Methods for evaluating changes in health care policy: the difference-in-differences approach. Jama. 2014 Dec 10;312(22):2401-2.

[4] Villa JM. diff: Simplifying the estimation of difference-in-differences treatment effects. The Stata Journal. 2016 Mar;16(1):52-71.

[5] DID analysis is a statistical method used to estimate the effect of intervention on the outcome variable. In a DID analysis, a treatment group that experiences a change (e.g., an intervention) and a control group that does not experience the change are compared. DID quantifies whether the treatment or change had a causal effect on the outcome. This is done by calculating the difference in the average outcome change in the treatment group before and after the change and subtracting the difference in the average outcome change in the control group before and after the change. Mathematically, the DID estimate can be represented as:
DID (Net Effect) = (YT1 – YT0) – (YC1 – YC0)
Where:
Y_{T1}, Y_{T0} is the average outcome in the treatment group after and before the intervention respectively. Y_{C1} and Y_{C0} the average outcome in the treatment group after and before the intervention respectively. If the net effect is statistically significant and positive, it suggests that the treatment or change had a positive causal effect on the outcome.

[6] Hardin JW, Hilbe JM. Generalized estimating equations. chapman and hall/CRC; 2002 Jul 30.

survey. The detailed methodology and questions used in the menstrual attitude index is presented in Annexure 3. Panel data models describe the individual behavior both across time and across individuals.

Qualitative analysis

The qualitative data analysis was conducted using ATLASTi (Version 7), a software that facilitates qualitative data analysis. After the transcriptions were translated into the English language, the study team imported the Word files (txt.) into ATLAS.ti. The team applied a thematic approach to analyze the transcripts. Iterative inductive and deductive coding methods were administered. The analysis emphasized themes such as decision-making attitudes of adolescents, menstrual health management, choice of contraception/contraception knowledge, and career aspirations.

A codebook was developed based on transcripts of 15% data and a coding structure was created to guide further data analysis. A senior researcher, with expertise in qualitative analysis reviewed the codes and the coders then agreed on a codebook to code all the transcripts.

To maintain confidentiality and anonymity, the qualitative data of all illustrative quotations are anonymized. As per the confidentiality norms set and mentioned in our consent forms, the data was anonymous for all our readers (Miles & Huberman, 1994).

Chapter 3: Profile of Respondents

3.1. Background characteristics

A total of 1,993 adolescents were recruited at baseline and interviewed. Table 3.1 presents the socio-demographic characteristics of surveyed adolescents at baseline. Age profiles show that only 31% of girls interviewed were 18 to 19 years old. Almost eight out of ten girls were currently studying, while about three out of ten had ever attended any vocational training. The socio-demographic characteristics of the girls are similar across both the intervention and control groups.

`

Background characteristic	Intervention		Control		p-value (χ^2 test)
	n=997	% (95%CI)	n=996	% (95%CI)	
Girls age (in years)					

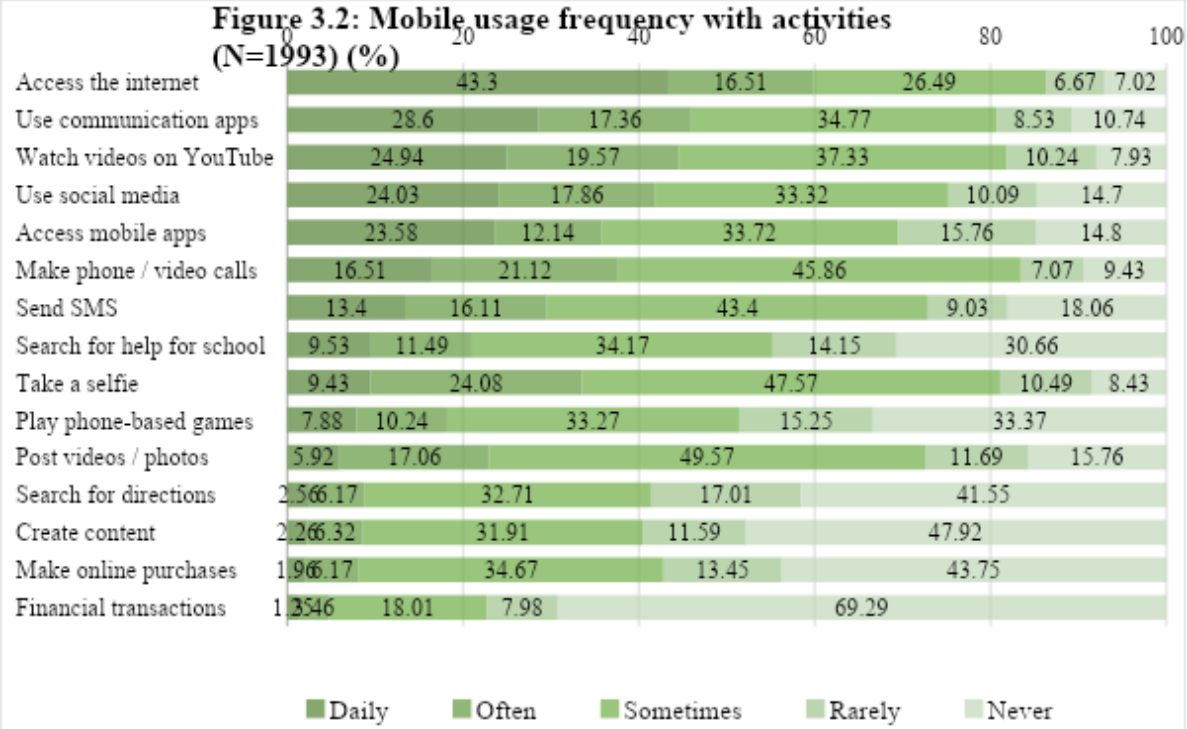
15-17	688	69.0 (65.4 - 72.4)	678	68.1 (65.2 - 70.8)	0.653
18-19	309	31.0 (27.6 - 34.6)	318	31.9 (29.2 - 34.8)	
Currently studying					
Yes	812	81.4 (78.0 - 84.5)	807	81.0 (77.8 - 83.9)	0.81
No	185	18.6 (15.5 - 22.0)	189	19.0 (16.1 - 22.2)	
Household with BPL card					
Yes	185	18.6 (15.7 - 21.8)	198	19.9 (17.5 - 22.5)	0.453
No	812	81.4 (78.2 - 84.3)	798	80.1 (77.5 - 82.5)	
Ever attended any vocational training					
Yes	348	34.9 (31.6 - 38.4)	311	31.2 (28.4 - 34.9)	0.081
No	649	65.1 (61.6 - 68.4)	685	68.8 (65.8 - 71.6)	
Number of siblings					
0	37	3.7 (2.8 - 4.9)	24	2.4 (1.5 - 3.7)	0.502
1	175	17.6 (14.5 - 21.1)	182	18.3 (15.8 - 21.1)	
2	307	30.8 (27.5 - 34.3)	300	30.1 (27.3 - 33.1)	
3	233	23.4 (20.9 -26.1)	246	24.7 (22.2 - 27.4)	
4+	245	24.6 (22.1 - 27.2)	244	24.5 (21.4 - 27.9)	
Parental education (10th standard and above)					
Both	149	14.9 (12.3 - 18.1)	155	15.6 (13.3 - 18.1)	0.218
Only Father	283	28.4 (25.6 - 31.3)	276	27.7 (24.7 - 30.9)	
Only Mother	45	4.5 (3.3 - 6.2)	28	2.8 (1.7 - 4.7)	
None	520	52.2 (47.7 - 56.6)	537	53.9 (50.6 - 57.2)	
Caste					
SC	406	40.7 (37.2- 44.4)	419	42.1 (38.6 - 45.6)	0.749
ST	163	16.3 (13.2 - 20.1)	168	16.9 (14.0 - 20.2)	

Other	351	42.9 (38.5 - 47.4)	343	41.1 (37.5 - 44.70	
Religion					
Hindu	858	86.1 (82.3 - 89.2)	844	84.7 (80.4 - 88.3)	0.404
Non-Hindu	139	13.9 (10.8 - 17.7)	152	15.3 (11.7 - 19.6)	
Note: No significant difference in background characteristic was observed between the intervention and control groups.					

3.2 Frequency distribution of mobile phone usage

Twenty four percent of girls owned their phone across all three cities, while 76% shared their Android phones with an older member of their family. Among girls who reported sharing their phones, most shared with more than two people in the family. Twenty percent of participants reported challenges in accessing the phone. Despite this, mobile usage was the same for girls who share and those who own mobile devices.

Figure 3.2 presents mobile usage frequency and distribution across different activities among all the girls both treatment and control. n=1,993) surveyed during baseline. Sixty percent reported using their phones to access the internet “daily” or “often”. Nearly half of the girls reported using their phone “daily” or “often” to: use communication apps (46%), watch videos on YouTube (45%), and access social media (42%). More than two-thirds of girls (69%) reported never using their phones for financial transactions, while 44% never made online purchases.



n= All girls in baseline (1,993)

3.3 Background characteristics of girls with shared phones

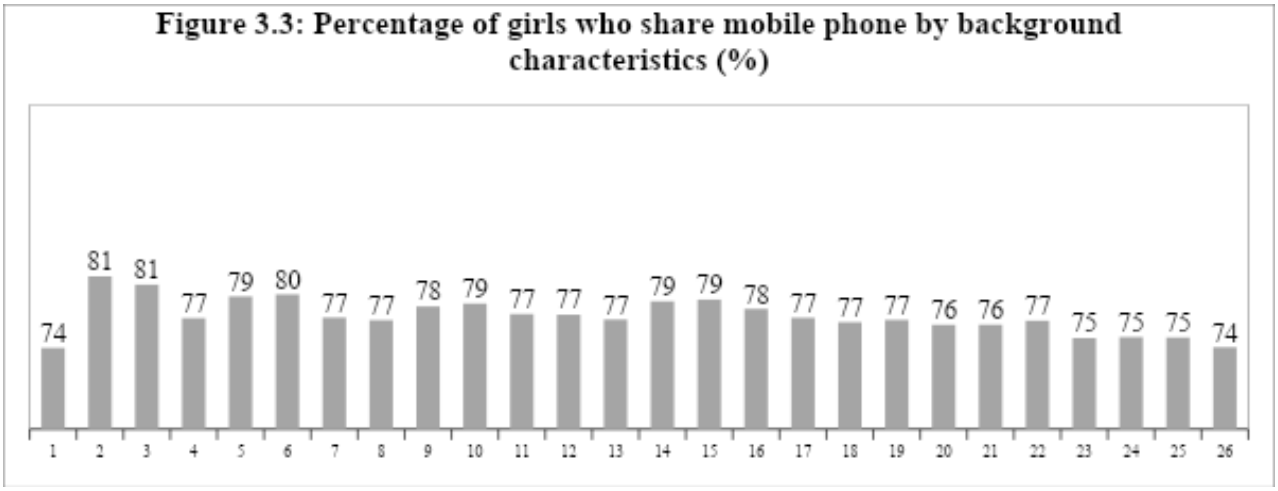


Figure 3.3 presents the distribution of girls who shared their mobile devices with any other household member by background characteristics. Analysis by the background characteristics showed similar results across age, religion, caste, BPL holding, type of siblings, parent's education, girl's education, and affiliation to current institution.

Chapter 4: Menstrual hygiene attitude and practice; Fertility Awareness

4.1. Background

Menstrual hygiene management (MHM) is a global public health issue that also encompasses social justice and human rights. Despite continuous advocacy and governmental and non-governmental efforts in addressing MHM, knowledge, attitude, and practice toward supporting MHM remains limited in some developing countries, including India (USAID 2022). As per the last round of the Indian National Family Health Survey, 2019-21, about half of women (49.0%) aged 15-19 years use unhygienic methods (cloth or other) during their periods, which was comparatively high among women from rural areas and socio-economically disadvantaged groups (IIPS & ICF 2021). Low awareness of menstrual hygiene products, knowledge of hygiene practice, accessibility, and cost contribute to low use of hygienic menstrual products, which is exacerbated by social taboos and stigma (IIPS & ICF 2021), (Babbar et al., 2021).

Digital technologies such as mobile applications, online consultation, telemedicine, patient outcomes, and overall health management are important health interventions (IIPS & ICF 2021). There is increasing demand for accessing health information and services online. Menstrual cycle and fertility tracking applications, which ensure confidentiality and provide safeguards, are growing in popularity. Use of mobile phones for buying online menstrual and SRH products in urban and peri-urban areas has the potential to revolutionize healthcare delivery, equip individuals, and improve the well-being of healthier communities (Ippoliti et al., 2017). This chapter describes study results related to the impact of GNG on knowledge and practice of menstrual hygiene, menstrual tracking, and attitudes towards various myths related to menstruation. Aligned with the above-mentioned key outcome, we examine the following key indicators:

- Awareness and use of menstrual products
- Tracking the menstrual cycle
- Health seeking for menstruation
- Attitudes, perceptions, and beliefs towards menstruation myths
- Knowledge of the fertile period

4.2. Awareness of various menstrual products

Table 4.1 shows the percentage of girls who heard about various menstrual hygiene products in each study group. Almost all respondents had heard about sanitary napkins at baseline (94%) and follow-up (98%), and awareness of other menstrual products was similar between treatment and control groups at baseline.

The change in awareness of tampons and menstrual cups was significantly higher from baseline to follow-up in the treatment group compared with the control group. Awareness rose by 66% each for tampons and menstrual cups in the treatment group, but only by 2% and 5%, respectively, in the control group. This marked increase suggests that the game successfully escalated awareness of tampons and menstrual cups in the study geographies. Multivariable analysis also suggests that by adjusting socio-demographic characteristics, GNG significantly improves awareness of various menstrual products (AOR of locally prepared napkins - 3.69, sanitary napkins - 1.53, tampons - 23.48, menstrual cup - 20.90 and reusable pads - 16.50). After adjusting key demographic characteristics, communication with frontline health workers was found to be a significant determinant of increasing awareness of menstrual products among girls in the treatment group (check Annexure 5).

Table 4.1: Percentage of girls aware of different menstrual hygiene products

Type of method	Treatment group (n=769)		Control group (n=928)		Net effect*	p-value
	Baseline %	Follow-up %	Baseline %	Follow-up %		
Locally prepared napkins	64.1	87.6	63.6	65.4	21.7	<0.001
Sanitary napkins	94.7	98.4	93.9	97.2	0.4	0.731
Tampons	19.4	85.8	18.3	20.8	64.0	<0.001
Menstrual cup	22.2	88.0	20.2	25.8	60.2	<0.001
Reusable pads	24.4	87.0	27.2	32.8	57.0	<0.001

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline).
* Includes girls who played level 2 and above in the treatment group.

Qualitative evidence also suggests that GNG has increased awareness of various hygienic menstrual products in the treatment group. Most of the girls reported that they came to know about tampons, menstrual cups, and reusable pads from GNG for the first time. They

also mentioned their increased knowledge of use and hygiene management. Thus, GNG has escalated their view of the variety of menstrual hygiene products available in the market.

R: We can not only use sanitary napkins, but also use we have other options during our menstruation, like menstrual cups, tampons, and reusable pads ……..

…… [Participant A aged 16 years, Delhi]

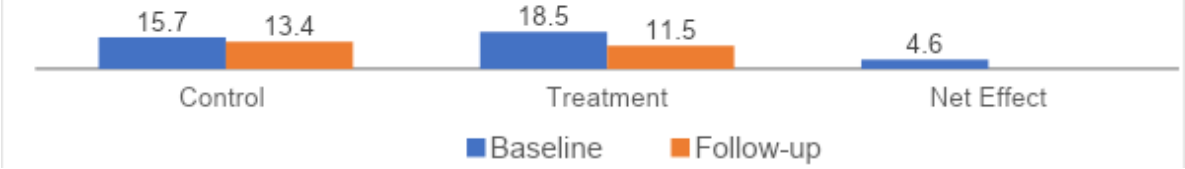
R - In periods product management, previously I did not know what a tampon and menstrual cup is and how to use them; I got to learn from the Go Nisha Go game…

……. [Participant B aged 16 years, Jaipur]

4.3. Use of menstrual hygiene products

Hygienic menstrual products keep girls comfortable during their periods and prevent various infections. However, use of these products depends on knowledge, accessibility, and affordability. Figure 4.1 presents unhygienic cloth use among girls in the study. There is a seven-percentage point decline in reported cloth use among girls in the treatment group, while about a two percent decline in the control group.

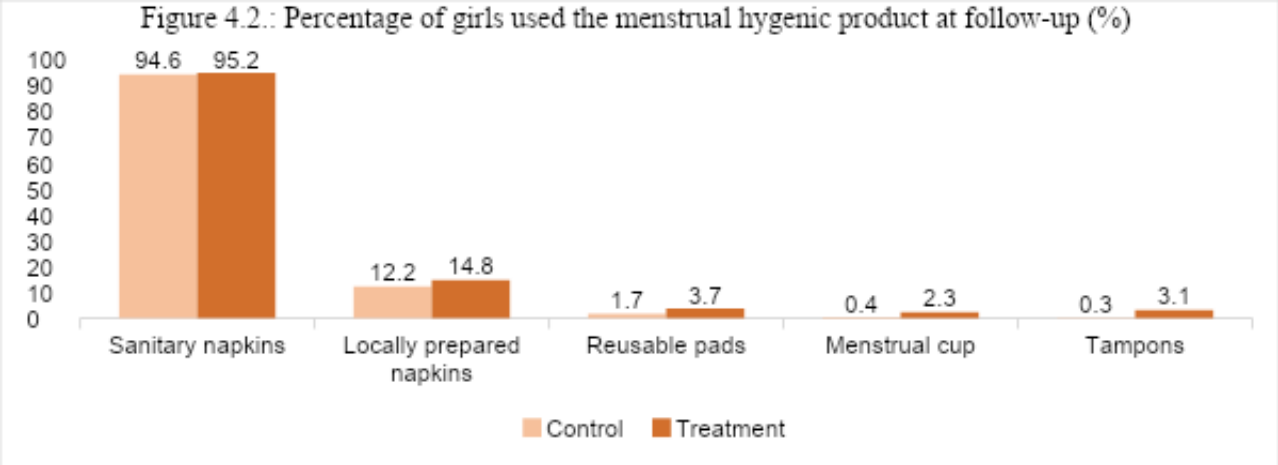
Figure 4.1: Percenatge of girls use cloth during their menstraual period (%)*



**n =The girls who achieved menarche (909 and 928 for the control group at baseline and follow-up, respectively, 757 and 769 for the treatment group at baseline and follow-up, respectively).*

The use of sanitary napkins remained universal (95%) in the study group. High use of sanitary napkins may be due to increased awareness through school, community, and various governmental and non-governmental attempts in recent years (UNESCO, 2023). The use of

tampons, menstrual cups, and reusable pads remained very low, only slightly higher in the treatment group (Figure 4.2).



**n = Girls who achieved menarche at the follow-up (928 for the control group and 769 for the treatment group). The addition of percentages may be less than 100% due to multiple responses.*

In the follow-up study, some girls in the treatment group also reported previously not knowing the consequence of using cloth as menstrual absorbents. Thus, GNG added and enhanced their comprehensive knowledge regarding menstrual products and hygiene practices.

R - I have got this information from this game that if there is pain during periods, then you can do exercise, you can do yoga, which will give you much relief and there are many such products related to periods like menstrual cups and pills which can help you. Due to this, you can get relief and your periods are faster and whatever clothes you have will not get dirty and should be worn in dark colours……

…….[Participant C aged 17 years, Jaipur]

"I learnt about periods that cloths should not be used during periods. Many types of the disease can occur due to using cloth."

…….[Participant D aged 15 years, Jaipur]

R – The reusable pads have to change every 6 hours……

.....[Participant F aged 18 years, Patna]

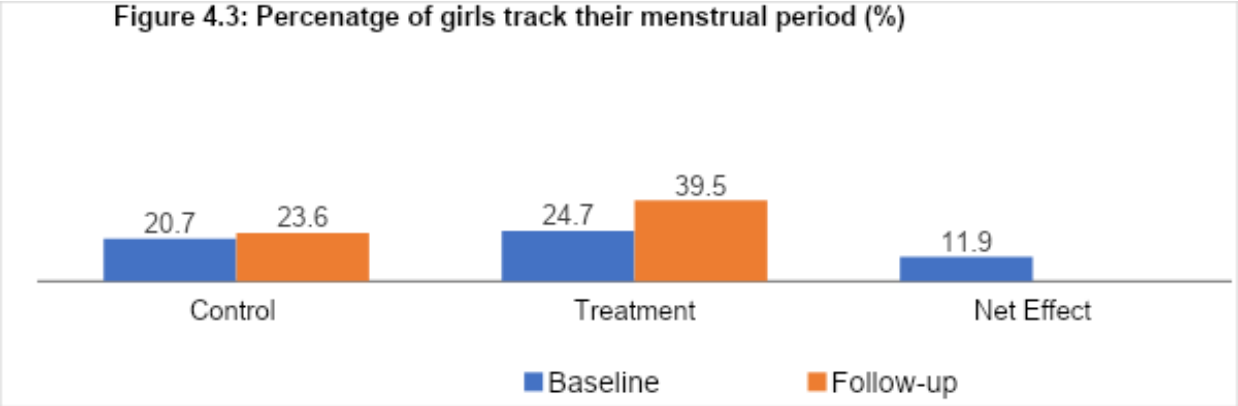
R: Yes, you can reuse a menstrual cup. you can wash it with Dettol and hot water and reuse it. We can use a menstrual cup for 5 to 10 years; after that, it won't stay, it might get spoilt or expire. The tampon cannot be reused because it is made of cotton and threads at the bottom……

.....[Participant G aged 18 years, Delhi]

4.4. Tracking the menstrual cycle

More girls reported tracking their menstrual cycle at follow-up compared to the baseline. Reported cycle tracking increased by 15% in the treatment group, but by only 3% in the control group.

Figure 4.3: Percenatge of girls track their menstrual period (%)



**N = Girls who achieved menarche (909 and 928 for the control group at baseline and follow-up, respectively, and 757 and 749 for the treatment group at baseline and follow-up, respectively)*

The calculated net effect suggests that GNG contributed to the significant rise of 12 percentage points (Figure 4.3). Adjusting for all socio demographic factors, girls who played GNG were more likely to report tracking their period (AOR: 1.76 (1.29-2.41), p<0.001). Qualitative evidence also suggested that girls started to use the mobile applications mentioned in the game and for menstrual tracking.

"I never used this tracking app before. But after playing the game, I came to know that there is some app and then I installed this app in my phone to get help from it. Through this, I now can track the date of my periods and I get clear information about it."

[Participant H aged 19 years, Patna

R: Yes, I remember a link. There were apps like 'Pink Legal', 'That Mate' and 'Cycle beads'. I had used the 'cycle beads' app. They are to track periods. I have downloaded it on my phone, and I still use it.

.....[Participant G aged 18 years, Delhi

4.5. Health seeking for menstruation related concerns

Seeking healthcare from a trained health professional is necessary to address problems associated with periods. The study estimated girls' intentions to seek formal health services if they faced any menstruation-related problems or doubts in the next six months. A significant time-by-treatment effect was seen in health-seeking behavior (See Table 4.2). It suggests that girls who played GNG were twice as likely (AOR 2.15 (95% CI 1.51-3.06, p<0.00) to talk to healthcare providers if they faced any issues in menstruation-related problems, adjusted for socio-demographic indicators such as age, education of girls, mother's education, religion, caste, household poverty status (BPL/non-BPL). Similarly, girls who played GNG were 87% more likely to report that they would consult a healthcare provider (AOR 1.87 (95% CI 1.31-2.69, p<0.001) if they encountered any menstruation-related doubts.

Table 4.2. Effects for adjusted GEE logistic regression assessing effects of GNG game on health seeking for menstruation (N = 1677 girls)				
	Talk to health care provider if she faces any menstruation-related health problem *(Ref: Talk to friends/family, search online, or don't do anything)*		Talk to health care provider if she comes across any menstruation-related doubts *(Ref: Talk to friends/family, search online, or don't do anything)*	
Indicators	AOR* (95% CI)	p-value	AOR* (95% CI)	p-value
Time (Ref baseline)	2.13 (1.67- 2.72)	<0.001	2.02 (1.57- 2.59)	<0.001
Treatment (Ref control)	1.06 (0.79- 1.44)	0.692	1.20 (0.89- 1.62)	0.228
Net Effect	2.15 (1.51- 3.06)	<0.001	1.87 (1.31- 2.69)	0.001
**AOR: Adjusted Odds ratio, i.e., adjusting to key socio-demographic indicators such as age, education of girls, mother's education, religion, caste, household poverty status (BPL/non-BPL) CI: Confidence Interval*				

4.6. Attitudes, perceptions, and beliefs toward menstruation myths

Sociocultural taboos, beliefs, and myths about menstruation are significant barriers to achieving period equity among women and girls. This is further compounded by the low level of knowledge and poor understanding of puberty and reproductive health. The game aims to reduce various myths and misconceptions associated with menstruation. We administered a series of Likert Scale questions to measure attitude towards menstruation. The mean menstrual attitude index[7] has increased among girls in the treatment group, as compared to the control group. The mean menstrual attitude index (MMAI) was significantly higher ($p<0.001$) in the treatment group (MMAI=5.9) compared to the control group (MMAI = 5.4), indicating that girls in the treatment group had healthier attitudes toward menstrual practices than those in the control group. The multivariable panel linear regression analysis[8] also suggests that adjusting to time and other sociodemographic factors, girls in the treatment group were less likely to agree with myths and taboos related to menstruation (β coefficient=1.28 (0.65-1.90), $p<0.001$). This implies that the game effectively increased awareness of menstrual myths among the treatment group (Figure 4.4).

Table 4.3: Percentage of girls who showed positive attitudes towards the following statement.						
	Treatment group (n=749)		Control group (n=928)			
Percentage of girls who:	Baseline	Follow-up	Baseline	Follow-up	Net effect	p-value

[7] The mean menstrual attitude index is based on the ten questions asked in the baseline and follow-up surveys (α =0.73 in baseline and 0.67 in follow-up). The detailed construction of the menstrual index is presented in Annexure 3.

[8] Panel regression with a random effect model is used.

Agree that "getting period is part of women's life."	97.2	98.0	96.2	98.7	-1.7	0.120
Agree that "getting a period is healthy."	92.3	93.6	93.0	90.0	4.4	0.020
Disagree that "Your period blood is dirty."	16.6	22.6	15.9	14.2	7.7	0.003
Disagree that "You should not attend school when you have your period."	43.4	66.5	43.1	61.0	5.2	0.125
Disagree that "You should not attend religious services when you have your period."	20.8	29.2	21.1	25.5	4.0	0.178
Disagree that "You should not play sports when you have your period."	35.8	60.3	36.3	51.9	8.9	0.008
Disagree that "You should not wear certain clothes if you have your period."	23.4	42.7	24.6	33.3	10.6	0.001
Agree that "Girls should not be embarrassed to tell someone if they have their periods."	75.0	64.4	70.7	69.9	-9.9	0.002
Disagree that "There are some foods you should not eat when you have your period."	21.5	39.3	24.9	30.3	12.4	<0.001
Disagree that "A girl with her period should not enter the kitchen."	54.9	73.4	54.5	68.3	4.8	0.151
Mean menstrual attitude index*	4.8 (4.7-4.9)	5.9 (5.8-6.0)	4.8 (4.7-4.9)	5.4 (5.3-5.6)	0.5	<0.001

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline).
*The mean menstrual attitude index is based on the ten questions (Range 0-10) mentioned in Annexure 3 asked in baseline and follow-up (α =0.73 in baseline and 0.67 in follow-up)
@The difference in mean menstrual attitude index is statistically significant at the follow-up (p=<0.001)

Almost all respondents (94% in treatment and 90% in the control group in follow-up) reported that "getting periods is healthy". However, 23% of girls in the treatment group disagreed and strongly disagreed with the statement "Menstrual blood is dirty" at follow-up, which slightly improved from baseline. Multivariable analysis showed that girls who played GNG were 69% more likely (AOR 1.69 (95% CI: 1.22-2.33)) to disagree or strongly disagree that period blood is impure. Attitudes related to participating in school, sports, and religious services, and entering the kitchen during menstrual periods improved most amongst the group that played GNG. The net effect of the disagreement with the statement *"You should not play sports when you have your period"* was nine percentage points, i.e., a positive change in menstrual attitude in the treatment group.

R: "The game informed me that the blood that flows during the periods is not considered to be dirty. Also, one shouldn't be restrained from worshiping, and any religious activity. So, there is nothing you can't do during your period."

.....[Participant I aged 16 years, Delhi]

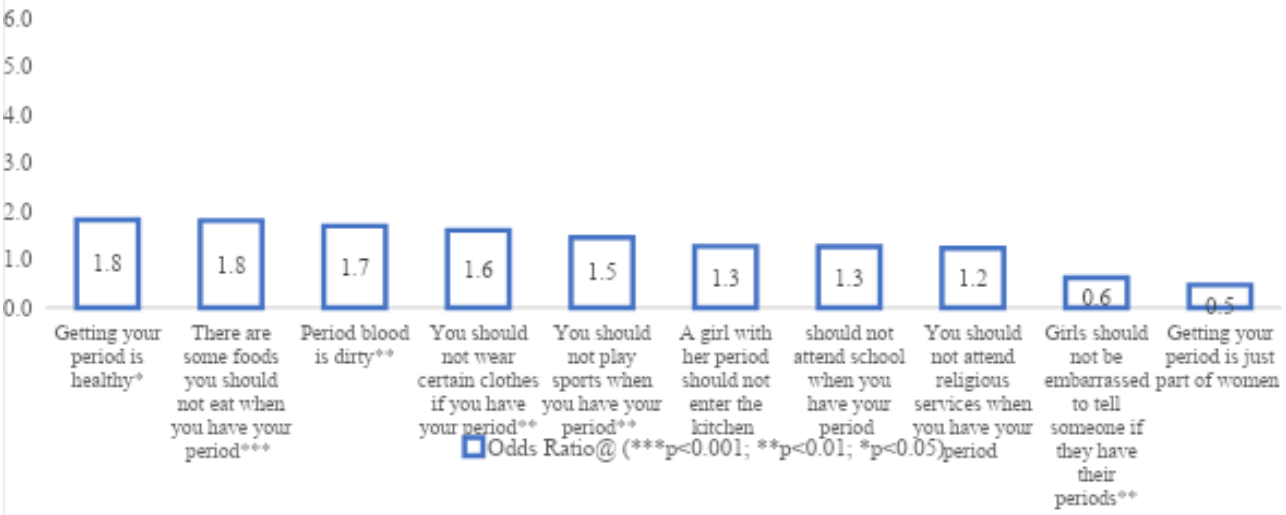
"I learned from Go Nisha Go, that you shouldn't feel shaming for your blood stains during periods. I have also learned, how to get out of this feeling of shy or hesitation regarding period."

.....[Participant J aged 16 years, Jaipur]

"I learned from GNG, period is natural, there is nothing like you become impure and dirty as you bleed".

.....[Participant K aged 15 years, Jaipur]

Figure 4.4: Effects for adjusted GEE logistic regression assessing effects of GNG intervention on menstrual attitude statements

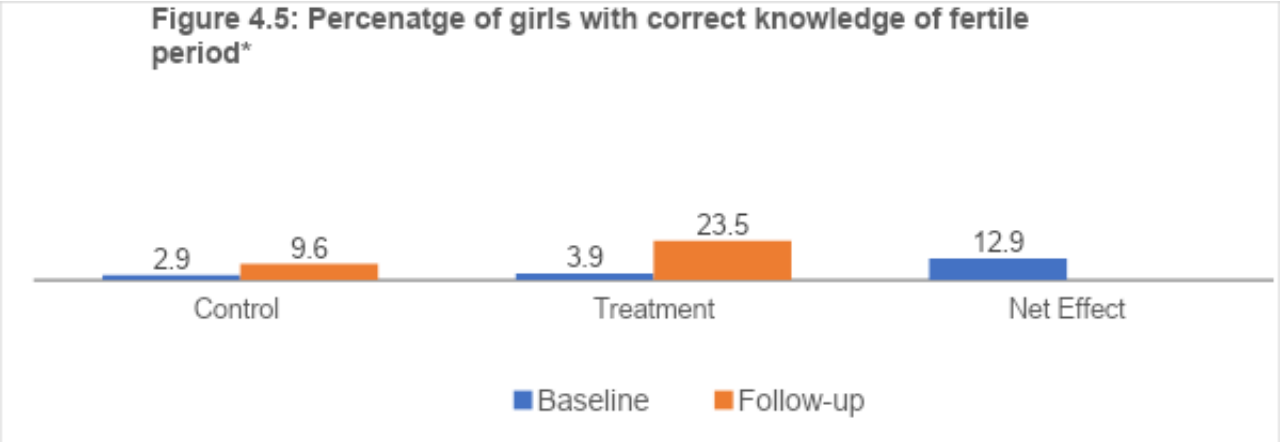


@Adjusted to all other variables such as Age, Respondents' Education, Mothers' Education, Religion, Caste, and BPL HHs. Analyzed for the girls who played level 2 or more in the treatment group.

Qualitative evidence also shows that girls attributed GNG to their improved beliefs and attitudes concerning periods and period management.

4.7. Knowledge of the fertile cycle

The study found that girls in the treatment group expressed improved knowledge about the correct fertile period (Figure 4.5).



N= 928 for the control group at baseline and end line, respectively, and 749 for the treatment group at baseline and follow-up, respectively)

At baseline, very few adolescent girls in the study group had a correct understanding of the fertile period. There was only a minimal increase in knowledge of the control group participants at follow-up. After adjusting for specific socio-demographic factors, we found that girls who played the game were twice as likely (AOR 2.17 (1.19-3.94), p=0.011) to have correct knowledge about the fertile period of the menstrual cycle. Qualitative data also indicate increased knowledge of the fertile period. Though there was significant improvement in awareness of the fertile period among girls in the treatment group (4% to 24%), the majority of girls still expressed low awareness. This suggests that further sustained intervention is needed to increase girls' awareness and understanding of their fertile period.

R: Yes, about the cycle period of the periods. Once the periods rotate from 14 days to 21 days when it gets completed, the possibility of getting pregnant increases.

...[Participant L aged 18 years, Jaipur]

When a lady has a period, a few days after or a few days before, there is a time for pregnancy; then the lady should not have sex at that time. Yes, girls should usually know when they have to physically and with whom to be or what and what things to use….

.... [Participant M aged 19 years, Jaipur]

4.8. Summary

Participants in the treatment group expressed significantly improved awareness of menstrual hygiene methods, knowledge of fertility, and beliefs and attitudes toward menstruation when compared to participants in the control group. Quantitative and qualitative evidence indicate that GNG supported this shift in knowledge and attitudes. Several girls attributed their learning and perspectives to playing GNG. Many girls also reported shifts in behavior, such as the increase in reported menstrual cycle tracking in the treatment group. While certain practices remain unchanged, such as high use of sanitary pads among all groups, GNG was effective in raising awareness and knowledge of key issues.

Chapter 5: Contraceptive methods – Knowledge, awareness, and self-efficacy

5.1. Background

Initiating open and informative discussions about contraception with adolescents has become a growing challenge worldwide (ACOG, 2017). Unmarried teenage girls often encounter significant obstacles when attempting to engage in such conversations with their family and peers, such as societal stigma and preconceived biases (UNFPA, 2017; Woog & Kågesten, 2017).

Digital interventions can play a role in initiating these discussions by spreading awareness, gathering evidence, and offering accurate information. These interventions provide a platform with minimal human interaction, allowing seekers to remain anonymous. Those who use these platforms may feel less likely to face judgment and stigma while they seek information. As a result, digital platforms that provide information on sexual health and contraception have rapidly gained popularity (Guse et al., 2012).

Comprehensive knowledge of contraception is a critical component of SRH education for adolescents (Patton et al., 2016). However, many adolescents lack a comprehensive understanding of sexual health and contraceptive use despite receiving sex education within educational institutions (Chandra-Mouli et al., 2014). When adolescents have access to accurate and comprehensive information about contraception, it empowers them to make informed choices regarding their sexual health (Darak et al., 2021; Daruwalla et al, 2018). This knowledge reduces the risk of unintended pregnancies and sexually transmitted infections (STIs)(Chandra-Mouli & Akwara, 2020). Comprehensive sex education should also emphasize the significance of consent, effective communication, and fostering healthy partner relationships.

One of the key outcomes of the GNG was an assessment of how gameplay enhances attitudes, self-confidence, and decision-making abilities in managing self-care, family

planning and reproductive health, negotiating consensual sexual activities, and using contraceptives, as well as accessing DTC products, information, and care.

This chapter focuses on the understanding of various contraceptive methods and personal agency in relationships among adolescent girls. Aligned with the key outcomes, we examine the following key indicators in the form of the percentage of girls who have:

- Awareness of modern reversible contraceptive methods
- Comprehensive knowledge of modern reversible contraceptive methods
- Reproductive health self-efficacy and decision-making power

5.2. Awareness of modern reversible contraceptive methods

For most contraceptive methods, the shift in awareness was higher in the treatment group compared to the control group. GNG describes each method comprehensively, detailing correct use of each method, cost of procurement, whether it can be procured over the counter, if it requires a partner's support, and duration of effectiveness. . The most commonly recognized contraceptive at baseline was condoms, and much of its popularity could be owed to the common marketing of the product. In the treatment group, awareness of intrauterine devices (IUDs) expressed the greatest increase. The game was found to be effective in improving comprehensive knowledge of most contraceptives (more details in the next section). Table 5.1 shows shifts in awareness of contraceptives between baseline and follow-up, stratified into treatment and control groups.

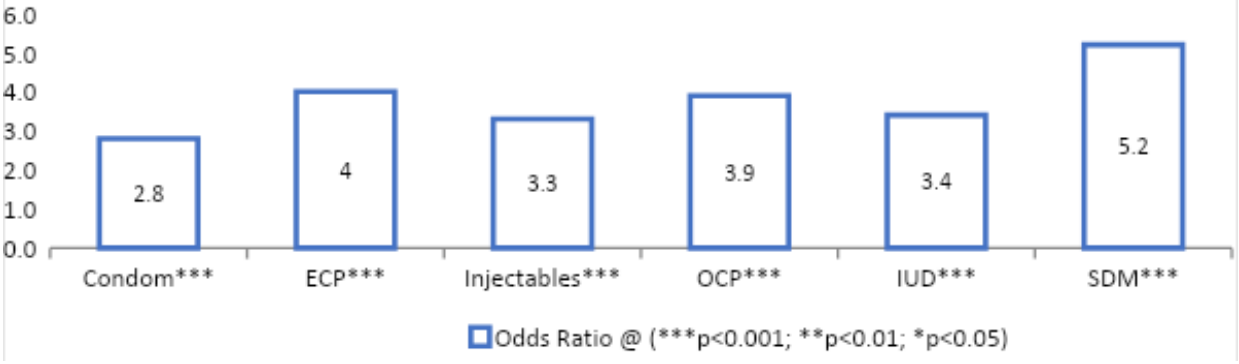
Table 5.1: Percentage of girls aware of different reversible contraceptive methods

Type of method	Treatment group (n=769)		Control group (n=928)		Net effect	p-value
	Baseline %	Follow-up %	Baseline %	Follow-up %		
Condom	63.5	95.8	61.2	88.3	5.2	0.048
ECP	39.3	61.8	37.2	28.8	30.9	<0.001
Injectables	46.3	70.7	42.8	40.6	26.6	<0.001
OCP	51.5	87.5	45.7	60.1	21.6	<0.001
IUD	33.7	71.8	33.3	44.5	26.9	<0.001
SDM	13.9	35.9	13.5	10.5	25.0	<0.001

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline). The net effect was adjusted for the respondent's age and education, mother's education, religion, ethnicity, and BPL status.

ECP = emergency contraceptive pill
OCP = oral contraceptive pill
IUD = intrauterine device
SDM = standard days method

Figure 5.1: Adjusted Odds Ratio assessing the effect of GNG game on awareness of different reversible contraceptive methods



Adjusted to all other variables such as respondent's age and education, mother's education, religion, ethnicity, and BPL status. . Analyzed for the girls who played level 4 or more in the treatment group.

Figure 5.1 illustrates results of multivariable regression of playing up to level 4 of the game, which focused on contraceptives, and knowledge of contraceptives, adjusted for background characteristics such as age, education, mother's education, religion, caste, and below-poverty-line (BPL) household status. The odds ratios indicate that playing through level 4 of GNG is associated with a significantly higher odds of knowledge of various reversible contraceptive methods. This indicates that the game effectively educates and increases awareness about contraceptives.

In-depth interviews also corroborate that GNG has directly informed the participants of modern reversible contraceptive methods in the treatment group. Several girls stated that the game provided them with new knowledge of different contraceptive methods.

R: "I learnt about different ways of contraception methods; it means there are pills, there are emergency pills, there is IUD and condoms etc ……..

…… [Participant A aged 18 years, Delhi]

R – "About emergency pills, suppose sometimes there were chances that you had sex without using a condom, then you have more chances of getting pregnant. Then if you immediately take emergency pills within 72 hours, then you can prevent your pregnancy. And about OCP, you must take one daily and the time is fixed so you have to take it at every day at the same time. If missed in the middle, then you have to start the service again the next day after the periods come.

……. [Participant J aged 16 years, Jaipur]

R: "I knew that pregnancy would stop by using the copper-t. But I didn't know that it gets inserted in the body of women. I also came to know about the pill that a woman must consume every day. I came to know about it through this game…"

……. [Participant M aged 18 years, Patna]

5.3. Comprehensive knowledge about modern contraceptive methods

This study measured the comprehensive knowledge of modern contraceptive methods by assessing the respondents' awareness about a specific contraceptive method, including its availability and use. The study found a significant increase in comprehensive knowledge of selected modern reversible contraceptive methods among girls in the treatment group from baseline to follow-up assessment.

Table 5.2 shows how comprehensive knowledge of different reversible contraceptive methods changed over time among girls in the treatment and control groups. Comprehensive knowledge is calculated based on three indicators: being aware of the method, knowing how to access the contraceptive, and knowing how to use the method. The net increase in comprehensive knowledge was observed most in OCPs, followed by condoms and ECPs.

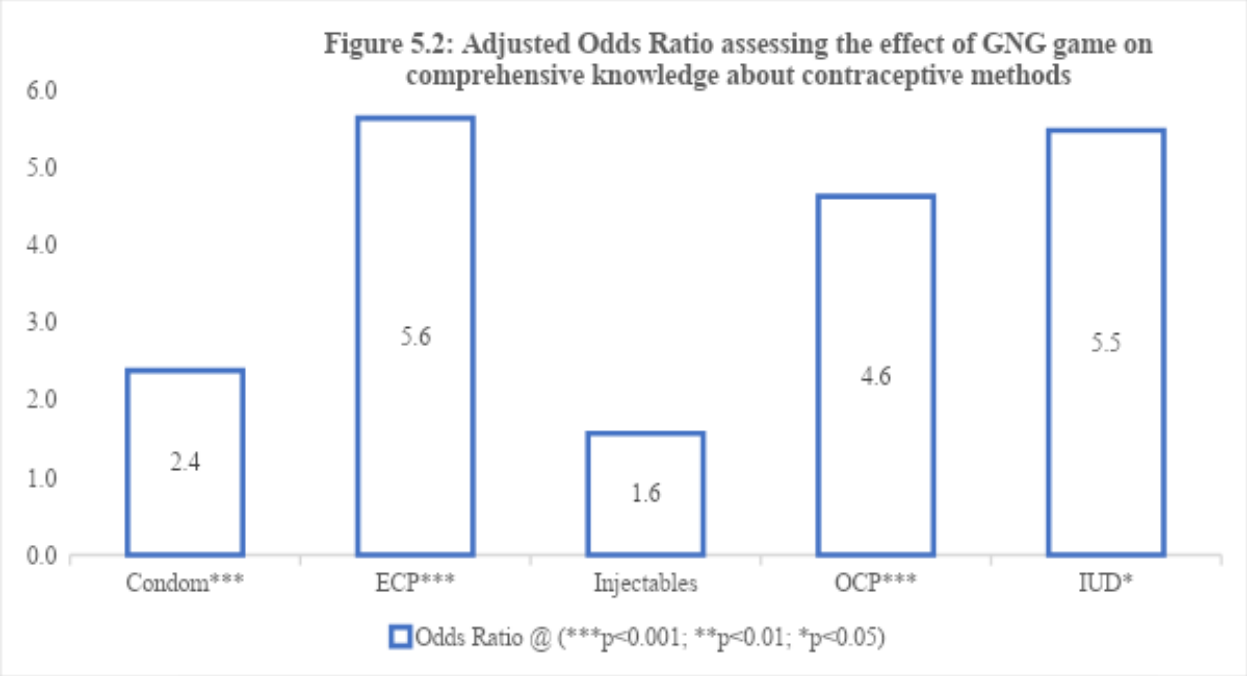
Table 5.2: Percentage of girls who played level-4 of the GNG game have comprehensive knowledge* about different reversible contraceptive methods

	Treatment group (n=710)		Control group (n=928)			
Type of method	Baseline %	Follow-up %	Baseline %	Follow-up %	Net effect	p-value

Condom	10.6	32.8	11.0	17.9	15.4	<0.001
ECP	1.7	17.7	2.2	4.7	13.5	<0.001
Injectables	1.7	13.5	0.9	4.8	7.8	<0.001
OCP	5.1	33.2	6.2	12.0	22.5	<0.001
IUD	0.3	12.1	0.5	4.6	7.7	<0.001

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline). The net effect adjusted for the respondent's age and education, mother's education, religion, ethnicity, and BPL status.
*Comprehensive knowledge calculated based on three indicators – awareness of the method, the source, and how to use the method.

Further analysis was done using the GEE regression model. The GEE model adjusted for background characteristics such as Age, Education, Mothers Education, Religion, Caste, and BPL household status. Figure 5.2 indicates that girls who played through level 4 of GNG expressed significantly greater comprehensive knowledge of various reversible contraceptive methods (except injectables) than girls who did not. The higher odds ratios suggest a positive relationship between playing the game and girls' comprehensive knowledge of contraceptive methods.



@Adjusted to all other variables such as respondent's age and education, mother's education, religion, ethnicity, and BPL status. . Analyzed for the girls who played level 4 or more in the treatment group.

Some participants in the qualitative in-depth interview stated that they first learned how to use several different contraception methods from the game. This signifies the importance of the game imparting in-depth knowledge on contraceptive methods.

5.4. Reproductive health self-efficacy and decision-making power

We asked girls whether they agreed or disagreed with statements related to decision-making power and negotiation in the baseline and follow-up surveys. The data suggests that improvement of attitudes related to communication of consent, intimacy, and contraception was much higher among the treatment group girls.

Table 5.3: Percentage of girls who responded to self-efficacy and decision-making-related statements.

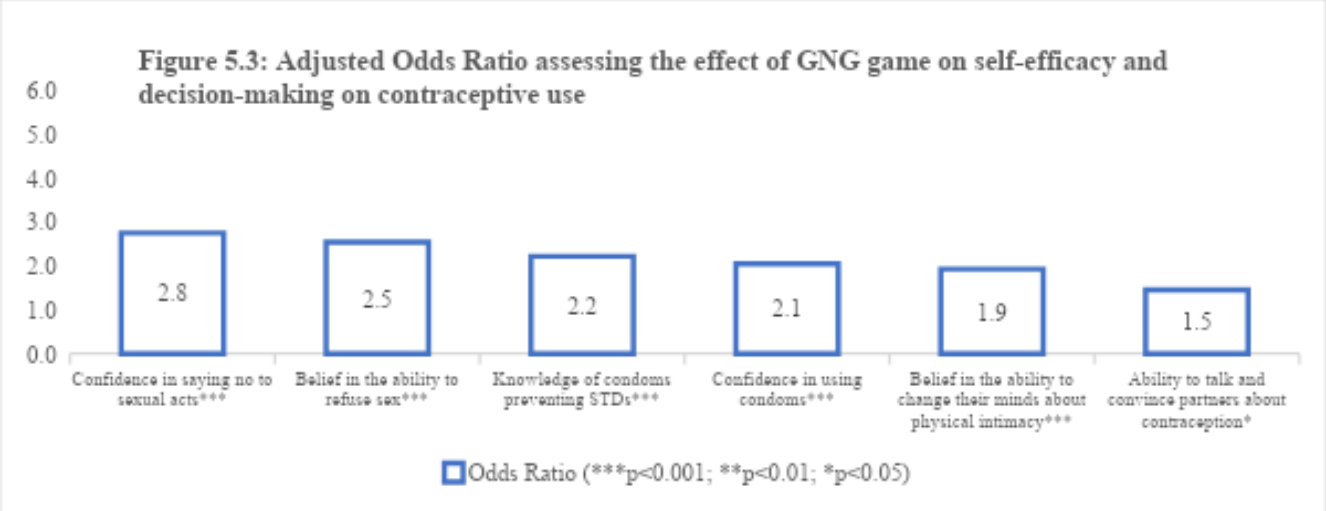
Percentage of girls who stated they were:	Treatment group (n=769)		Control group (n=928)		Net effect	p-value
	Baseline	Follow-up	Baseline	Follow-up		
Confident to say no to a sexual act if you wanted to say no	74.4	95.4	74.5	88.2	7.4	0.003
Confident to use a condom when her boyfriend is not willing to	74.8	93.1	73.4	86.0	5.7	0.031

Think girls can change their minds anytime about touching if they don't want to.	71.7	90.2	72.5	83.2	7.9	0.004
Think girls can change their minds anytime about kissing if they don't want it.	65.0	87.3	65.0	81.4	5.9	0.053
Think girls can change their minds anytime about sex if they don't want it.	65.8	88.8	65.7	80.4	8.4	0.004
Think their boyfriend should always consent for touching.	45.3	67.1	44.3	53.9	12.3	<0.001
Think their boyfriend should always consent for kissing.	47.7	70.7	47.6	57.9	12.8	<0.001
Think their boyfriend should always consent for sex.	48.2	71.3	49.6	58.8	13.8	<0.001
Think have the ability to refuse sex	40.7	77.2	42.2	58.9	19.8	<0.001
Know that condoms can prevent STDs	20.2	43.4	20.0	25.9	17.5	<0.001
Can talk and convince their partners if they don't want to use any contraception	20.8	50.6	21.8	42.9	8.7	0.008

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline). The net effect was adjusted for the respondent's age and education, mother's education, religion, ethnicity, and BPL status.

Girls in the treatment group displayed greater confidence to negotiate use of condoms when their boyfriend was not willing to, compared to the control group (net effect 5.7%). Girls in the treatment group were significantly more likely to believe that they had the confidence to refuse sex (net effect 20%) and expressed knowledge of condoms preventing STDs (net effect 18%). Further, girls in the treatment group were more likely to believe that they could negotiate contraceptive use if their partners were unwilling (net effect 9%). Similar results were noted about other self-efficacy and decision-making statements on contraceptive use shown in Table 5.4.

Figure 5.3 provides results of a GEE model, indicating that girls who played the game are more likely to express confidence in refusing physical contact, using condoms, believing they can change their minds, refusing sex, knowing about condom effectiveness, and being willing to talk about contraception. The p-values suggest that these associations are statistically significant.



@Adjusted to all other variables such as respondent's age and education, mother's education, religion, ethnicity, and BPL status. . Analyzed for the girls who played level 4 or more in the treatment group.

During the in-depth interviews the participants explained how the game helped in increasing knowledge about STDs, and importance of the use of condoms in prevention.

R: "From the game Go Nisha Go, I learnt that it is very necessary to use condom if you wish to have sex with your partner. It prevents one from having HIV Aids,=
R: "Through playing this game, came to know about the pills, earlier I knew only about the condoms. The emergency pills (ECP) that should be consumed within 72 hours and the pills (OCPs) that should be consumed daily; I came to know about it…"

……. [Participant Q aged 16 years, Jaipur]

R: "I knew about condoms, but I didn't know about copper-T and vasectomy, what it is, how it works. Apart from that, I knew about the medicines, that things are fine after having the medicines."

……. [Participant G aged 18 years, Delhi]

R: I learnt that one can take the contraception injection to delay the pregnancy up to 6 months. One can take emergency pills to pause the pregnancy for 72 hours.

……. [Participant R aged 15 years, Patna]

5.5. Summary

GNG significantly increased girls' knowledge of contraceptive methods, and enhanced comprehensive understanding of modern contraceptives, which is vital in promoting girls' reproductive health. Girls who played GNG also expressed increased confidence in negotiating physical contact, including refusing sex and using contraceptives, and held more positive attitudes toward consent and communication related to physical intimacy.

Notably, the game's impact appears consistent across different socio-demographic characteristics, indicating the game was uniformly effective throughout the entire intervention target group.

Chapter 6: Agency – Aspiration, Negotiation, and Consent

6.1. Background

Girls experience conflicts with parents and partners regarding decision-making. GNG aims to increase players' skills in negotiating daily life choices and personal agency. Pre-and post-surveys in this study gathered data on common conflicts that girls face, including issues such as delaying marriage, pursuing a career, having a romantic relationship, negotiating contraception use and choice, and exploring consent in relationships. All of these decisions are explored in GNG. Aligned with the above-mentioned key outcomes, we examine the following key indicators.

- Aspiration to pursue a career
- Negotiation for career, marriage, and life choices
- Consent in sexual relationship
- Women's safety and legal awareness of marriage and consensual sex

6.2. Aspirations

During the baseline survey, participants expressed diverse ranges of career aspirations. As reported, 19% of girls wanted to be a teacher, followed by 13%, 12%, and 10% of girls who wanted to be a doctor, police officer, and beautician, respectively. Almost all (95%) knew what they wanted to pursue in their future, but only a little more than half (56%) had started preparing for it.

6.3. Negotiation of career preparedness, marriage, and life choices

Table 6.1. presents the percentage of girls aware of curriculum vitae (CV), biodata, and internships as steps toward procuring employment. Awareness of CVs and biodata increased significantly in both groups of respondents; however, higher improvements were

observed in the treatment group (37% in baseline to 73% in the follow-up). Similarly, awareness of internships improved around three times in the treatment group from baseline to follow up, while it was doubled in the control group. Qualitative assessments also attributed this learning to GNG.

Table 6.1: Percentage of girls aware of curriculum vitae (CV)/biodata and internship

Particulars of career preparedness	Treatment group (n=769)		Control group (n=928)		Net effect*	p-value
	Baseline %	Follow-up %	Baseline %	Follow-up %		
Percentage of girls who are aware of CVs	37.1	72.8	35.5	52.3	19.0	<0.001
Percentage of girls who are aware of internship	19.9	69.1	16.8	34.7	31.3	<0.001

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline).

.

** Includes the girls who played level 1 and above in the treatment group.*

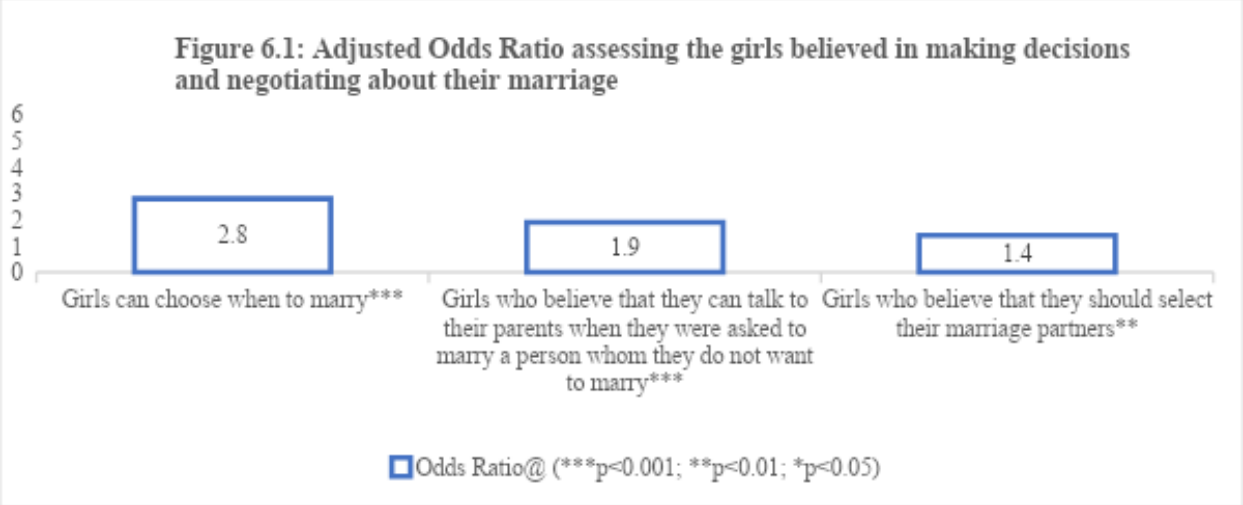
> *"I came to know about the biodata/ CV from the game. It was in details; it contains your name, qualification, you can apply for job with that. Internship was also mentioned, the meaning of internship is; if we have to do any job, we have to get a training before the job. Thus, you need to first go for an internship first before joining a job."....*
>
> *[Participant H aged 19 years, Patna]*

Table 6.2 presents indicators related to girls' beliefs and attitudes in negotiating marriage decisions. The percentage of girls who reported they could choose the timing of her marriage remained similar in the control group over time, whereas a significant rise of 14% (77% in baseline to 91% in follow-up) was observed in the treatment group. Thirty-two percent of girls believed they should select their marriage partners, which increased to 49% in the treatment group post intervention. After playing the game, 77% of girls (baseline 71%) believed they could negotiate with their parents if asked to marry someone they did not want to marry (net effect of 12.1 percentage point rise). Multivariable GEE analysis also supports that GNG affected these improvements in attitudes toward decision-making related to marriage (Figure 6.1).

Table 6.2: Percentage of girls believed in making decisions and negotiating about their marriage.

Negotiation in marriage	Treatment group (n=769)		Control group (n=928)		Net effect *	p-value
	Baseline %	Follow-up %	Baseline %	Follow-up %		
Percentage of girls who believed 'girls can choose when to marry'	77.1	90.5	77.0	77.8	12.6	<0.001
Percentage of girls who believe that they can talk to their parents when they were asked to marry a person whom they do not want to marry	70.6	77.2	73.3	67.8	12.1	0.011
Percentage of girls who believe that they should select their marriage partners	32.0	49.0	30.9	39.5	8.4	0.011

Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline).
** Includes the girls who played level 1 and above in the treatment group.*



@Adjusted to all other variables such as respondent's age and education, mother's education, religion, ethnicity, and BPL status. Analyzed for the girls who played level 1 or more in the treatment group.

Qualitative evidence also suggests that some participants can and will negotiate with their parents regarding the career and delaying the marriage. Some of them have already started negotiating with parents, and they are successful in delaying their marriage, as stated by participant S.

"I told my father that I don't want to get married right now. There are a few things I want to pursue for my future. Then my father agreed and said that it's okay, if you want to do something concrete then it's okay. Then we rejected marriage proposal, and I am not married yet."

Participant S aged 18 years, Patna]

"Yes, I have learned that if you want to make a career, then you have to convince the family, you have to take a stand for yourself, do not go against the family and explain it to the family and the family can understand and to marry late, you have to convince and convince the family members….

…. [Participant C aged 19 years, Jaipur]

R: I can convince my parents while discussing with them about the difference in opinion. This is the only way I can negotiate.

…. [Participant A aged 17 years, Delhi]

R: It shouldn't be like you are getting married because your family is forcing you. In such situation you should convince your parents that you do not want to get married now, you want to continue your study further or you want to do job. And when you feel like you want to get married then only you should.

…. [Participant O aged 17 years, Patna]

Survey results indicate that girls in the treatment group became more confident in negotiating daily life choices. During the baseline survey, only 38% of girls in the treatment group indicated that they would talk to their parents if they disapproved of their clothing choice. This increased to 57% in the follow-up survey after playing GNG.

An 18-year-old participant of Patna clearly stated that she started negotiating and sharing her thoughts and opinions to her parents, and she has gained confidence from Nisha (central character of GNG).

"Yes, I have done it, as Nisha had kept her thoughts openly, so I learned from Nisha how to share my thoughts with my parents.
Earlier, I was not able to express my thoughts openly, but it was not like that, I was very scared of my father and my mother now I am able to process my words."

….. [Participant T aged 18 years, Patna]

6.4. Consent in sexual relationship

This section is focused on the attitude of participants on consent in romantic relationships. Many participants in the treatment group during the follow-up survey mentioned that they learned about the concept of consent from the game. The survey also asked questions that gauged the participants' sense of agency and confidence in addressing consent with partners, including confidence in refusing an action. We explored girls' attitudes in their current and future relationships and how they would handle future opportunities for communication with romantic partners.

> *"If we are in a relationship, then we have to talk openly with our partner. Even if the male partner wants to have sex (physical relationship) and we must use condom, and we should talk about it with him."*
>
> *..... [Participant aged 17 years, Patna]*

At the baseline survey, less than half of girls in both groups stated that consent should always be given before touching, kissing or having sex. These numbers increased in both groups during the follow up survey, but significantly more girls in the treatment group indicated that consent is necessary in each of these scenarios, when compared to the control group. For example, in the treatment group, the number of girls who stated that mutual consent should take place before having sex increased from 48% in the baseline to 71% in the follow up survey. Further analysis calculated that the net effect of playing through level 3 of GNG led to an increase of 14 percentage points. Level 3 of GNG discusses the importance of obtaining consent in a healthy and respectful romantic relationship (Table 6.3).

"Furthermore, it is important to note that regardless of the use of safety products, engaging in a physical relationship should only occur with mutual consent and when both individuals are in the right frame of mind".....

..... [Participant U aged 17years, Delhi]

R: This should be done with consent of both. Only if it is your wish then only physical relation should happen otherwise not, even if your partner pressurizes you. Your consent is necessary.

..... [Participant V aged 16 years, Jaipur]

"I have learned a lot from this game like going out and doing job. You can go anywhere, and you can do job anywhere with parents' permission. Also, I came to know you can marry your choice of boy. I have gained confidence in myself when I go out and do outside things to be aware of and to express your views without any fear."

..... [Participant W aged 16 years, Jaipur]

Table 6.3: Percentage of girls who think their partner should give consent before physical intimacy.

Type of method	Treatment group (n=729)		Control group (n=928)		Net effect *	p-value
	Baseline %	Follow-up %	Baseline %	Follow-up %		
Percentage of girls who think their partner should always take consent for touching.	45.3	67.6	44.3	53.9	12.8	<0.001
Percentage of girls who think their partner should always take consent for kissing.	47.3	70.9	47.6	57.9	13.4	<0.001
Percentage of girls who think their partner should always take consent for sex.	47.6	70.9	49.6	58.8	14.1	<0.001

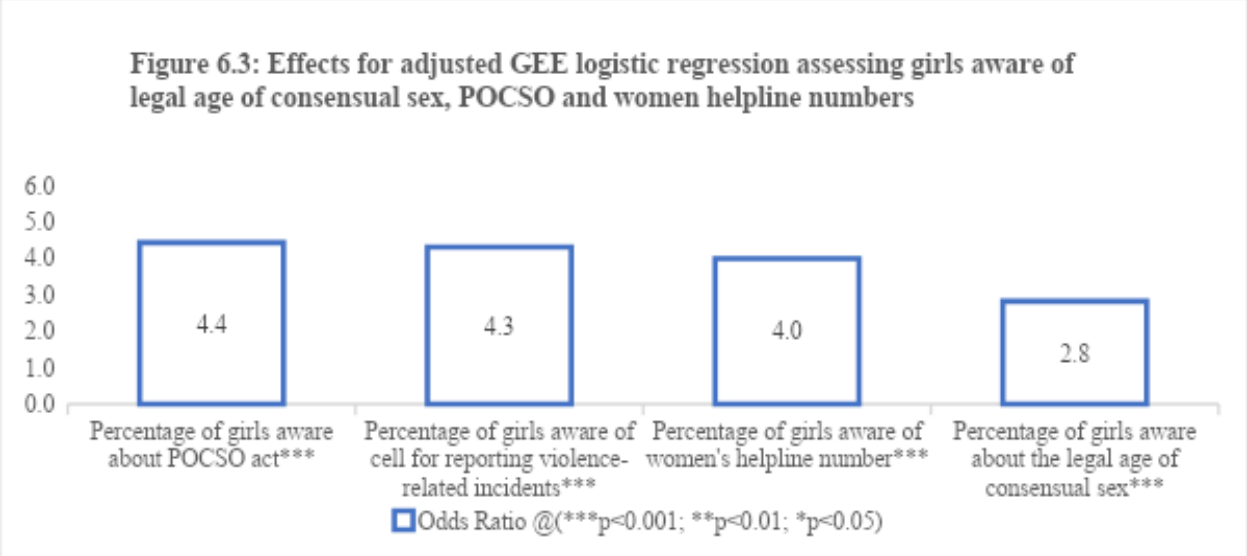
Note: Net effect = Treatment group (follow-up-baseline) – control group (follow-up-baseline).
The net effect was adjusted for respondent's age and education, mother's education, religion, ethnicity, Below poverty line (BPL) status.
** Includes the girls who played level 3 and above in the treatment group.*

6.5. Women's safety and legal awareness

Table 6.4. presents indicators related to women's safety and awareness of legal services for

support in case of harassment or abuse. The study found that playing GNG is correlated with improved awareness about the legal age of consensual sex (18 years) (Net effect = 25 percentage points). In the treatment group, 35% of girls were aware of the legal age of consensual sex in baseline, which rose to 60% in the follow-up; however, a very minimal rise of only one percentage point was observed in the control group.

Similarly, awareness of the POCSO Act (Protection of Children from Sexual Offense Act) of 2012 increased from 12% to 53% among girls in the treatment group. Awareness of helpline numbers and complaint cell numbers reporting violence against women almost doubled in the treatment group. These data suggest that GNG has improved awareness of helpline numbers and complaint cell numbers for reporting violence against women by 25 percentage points and 28 percentage points change, respectively. The GEE analysis also confirmed that by adjusting to all other socioeconomic and demographic covariates, the game improved knowledge about legal safeguards, safety measures, and helpline numbers (Figure 6.3).



@Adjusted to all other variables such as respondent's age and education, mother's education, religion, ethnicity, and BPL status. Analyzed for the girls who played level 1 or more in the treatment group.

6.6. Exploring DTC linkages

The game had 23 Direct-to-Consumer (DTC) links to various services and products, such as menstrual hygiene products, self-efficacy content, and period trackers. In the treatment group, there was a significant increase in the number of girls who purchased sanitary napkins online, from 5.5% at baseline to 19% during the follow-up. However, in the control group, there was only a slight increase of 0.5%. The overall shift of 13-percentage point increases in the number of girls purchasing sanitary napkins online is indicative that GNG improved access to certain online products and services in the study areas. In qualitative in-depth interviews, participants responded

to questions about their use of in-game DTC links and recalled several products and sources for accessing information related to menstrual hygiene, fertility tracking, and safety.

R: "yes, one was there related with Jaya. One of them was related to safety pin. Surrounding, means the place where you live, it should be safe. Some of them were also related with periods. I checked them out; web sites. One of them was related to period which detected period that helps one to keep remember about their safe days."
R: "Yes, cycle beads……"

……. [Participant A aged 17 years, Delhi]

R: "Yes. About the products, there was 'Sanaichi', 'Rahu Safe', 'Boond', and 'Unhealth care'. Not 'Unhealth' it was 'Intel Healthcare."

……. [Participant G aged 18 years, Delhi]

R: for example, menstrual cup and tampons and pads, safety pin app, app of the menstrual cycle was also there.

……. [Participant Q aged 16 years, Jaipur]

I – Ok, there are many links and products given inside this game, do you remember anything about it?
R – "Yes Men Health, Jaya app, Love Meter."

……. [Participant X aged 17 years, Patna]

6.7 Summary

Results from the follow up surveys indicate that girls in the treatment group expressed increased knowledge and improved attitudes related to career resources, decision making, consent with intimate partners, and resources for personal safety and legal protections. Each facet of the game contributes to a common goal of equipping girls with the information, resources, and confidence to increase self-agency and make informed choices in socially appropriate ways. Both qualitative and quantitative data highlight GNGs role in increasing this confidence in decision-making ability and willingness to negotiate for life decisions.

Chapter 7: Understanding the GNG Game Intervention

7.1. Background

The key to the success of any digital game intervention lies in its ability to engage the audience effectively, while delivering on its intended objectives. This chapter provides feedback from participants in the treatment group who at least played through level 1. This section details the results of the follow up survey in the treatment group in which participants responded to questions on their in-game learning experience. Participants also described their understanding and use of DTC links. We assess the influence of the game on the girls' understanding of the resources available.

7.2. Results

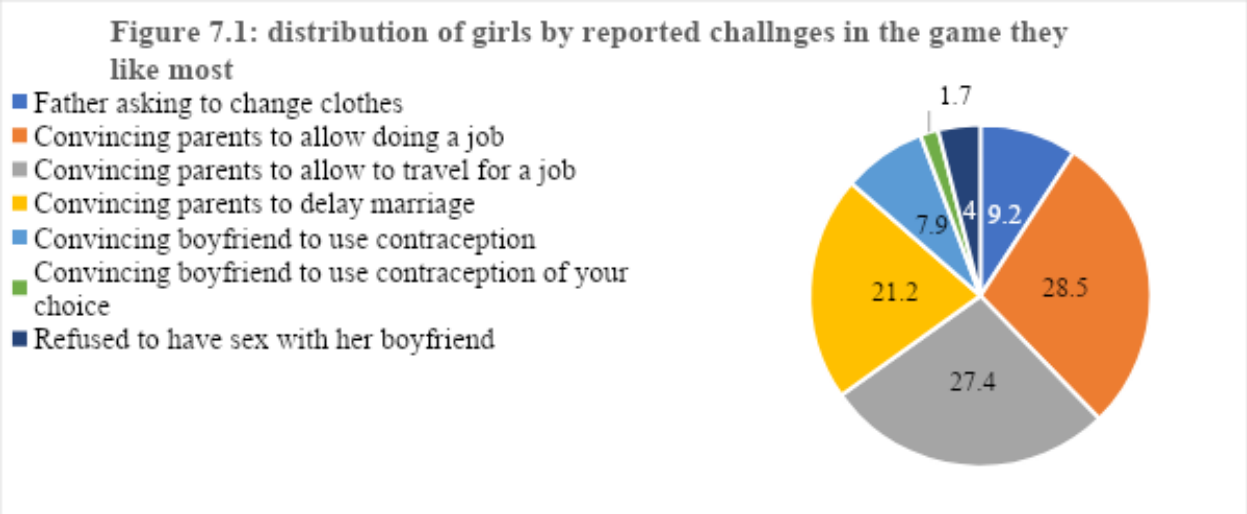
Of the participants who played Level 1, 89% completed Level 5. The program facilitator was the primary source of knowledge and awareness about the game. Few participants listed social media and Google Play Store as places where they learned about the game. Three-fourths of girls (74.3%) and two-thirds (66.2%) of girls who played GNG discussed it with others and recommended playing GNG respectively.

Table 7.1: Level of participation in the GNG game among the girls from the treatment group

Played Various Level	Number	Percent
Level		
Level 1	769	100
Level 2	749	97.4
Level 3	729	94.8
Level 4	710	92.3
Level 5	686	89.2
Source of Information		
Program facilitator	738	96
Browsing the Play Store	26	3.4
Instagram	11	1.4
Friend	11	1.4
YouTube	7	0.9
Other	5	0.7
Facebook	4	0.5
Relative	3	0.4
Discussed the content with others	571	74.3

Recommend playing Go Nisha Go to others	509	66.2
Total Sample (n)	769	100

The survey asked game participants about navigating challenges in the gameplay to understand their extent of understanding the game. Almost all respondents reported they remembered the situation where Nisha convinced her parents to do an internship/job and to travel;28.5% and 27.4% of participants reported liking these challenges the most (respectively).



n = The girls in treatment group (769)

7.3. Feedback on game characters

All treatment group participants were asked to describe GNGs characters (Table 7.2). The protagonist, Nisha, was the most memorable character, described as good-looking, knowledgeable, inspirational, and relatable. Diary closely followed Nisha in terms of recallability, and was described as funny, knowledgeable, relatable, and believable.
About 65% of respondents reported Nisha as the central character and said that they want to become like her. More than half (51.2%) of respondents reported Nisha as a character from whom they learned the most. Diary was reported as the funniest character in the game (60%). Also, the majority of participants did remember other characters and role models (88%-99%). Among the characters, Dr. Aruna and Fatima were reported as highly knowledgeable, while Dr. Paro was relatable, believable, and inspiring.

Table 7.2: Remembrance of all GNG characters by the treatment group participants

Character of the Game	% recall seeing the character in the game
Nisha	99.2
Ayush	96.0
Shireen	88.0
Paro	96.2
Anu	88.4
Dr. Aruna	88.7
Fatima	89.1
Diary	99.1
Nisha's Mother	99.0
Nisha's Father	98.7
Nisha's Sister	93.1

n = The girls in treatment group (769)

7.4. Learning from the game

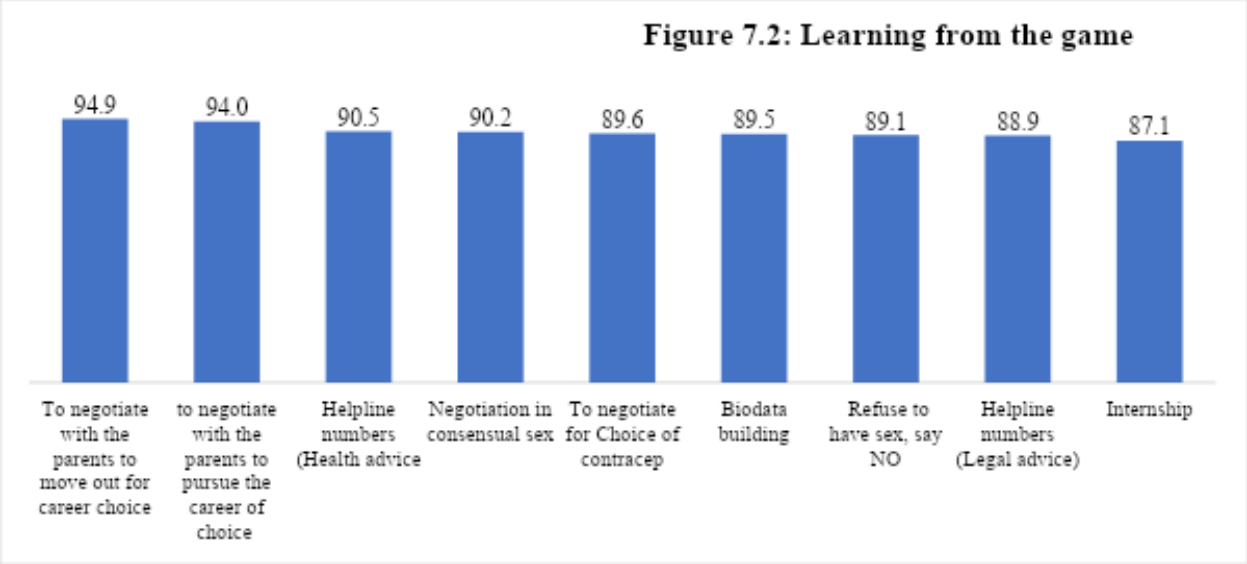


Figure 7.2: Learning from the game

n = 769

Most girls concurred learning about all the major themes covered in the game. For 94.9% of the players the most important takeaway was negotiating for career related mobility with parents closely followed by negotiation for career choice (94.0%). A significant

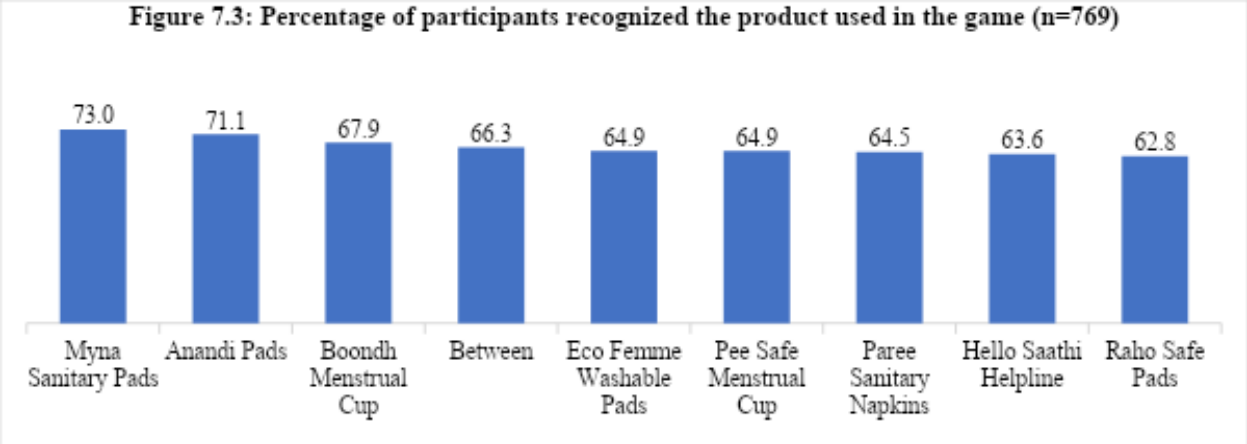
proportion of participants (90.5%) learned about helpline numbers for health advice from the game; Negotiation for consensual sex (90.2%); negotiation for using contraceptive of their choice (89.6%); biodata building (89.5%); refusing sex (89.1%); helpline number for legal advice (88.9%); and details about internship (87.1%).

All the categories have high percentages (all above 87%), which suggests that the game was generally effective across various learning objectives. The highest value (94.9%) on the graph indicated that the game was most effective at teaching participants how to negotiate with their parents about moving out for career reasons. A significant number of participants (90.5%) learned about helpline numbers for health advice from the game. Negotiation in consensual sex (90.2%): Over 90% of girls who played GNG attributed learning about negotiation skills in the context of consensual sex. Similarly, almost 90% of respondents mentioned that they learned to negotiate for the choice of contraceptives (89.6%) from playing GNG.

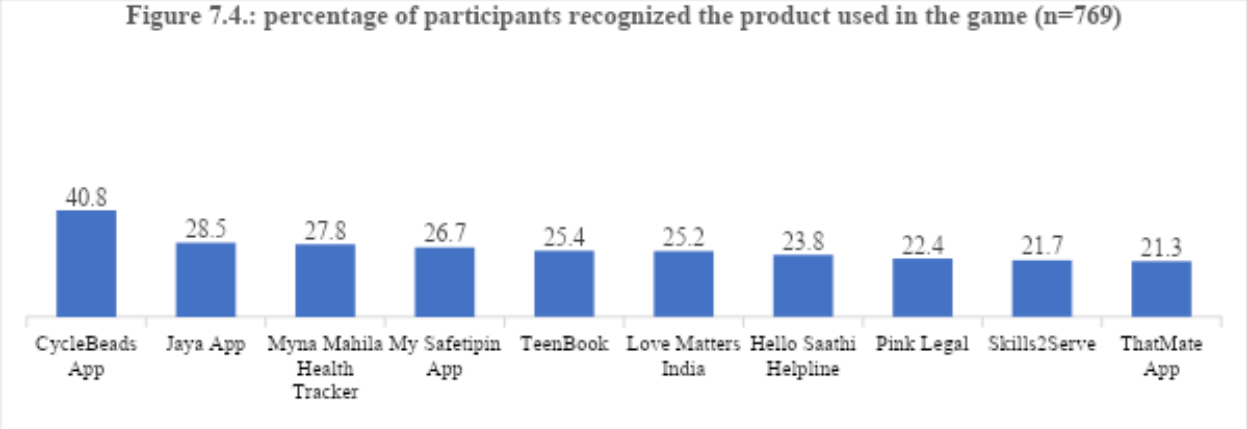
7.5. Knowledge of various products and apps used in the game

We asked about the various products shown in the game by showing a picture of the product. About 63%-73% of game participants recognized at least one product (Figure 7.3). However, use of applications (product and link) in the game remained comparatively low shown in figure 7.4. Among game participants, 41% used the Cycle beads app, followed by Jaya App and Myna Mahila Health Tracker (28% each).

Figure 7.3: Percentage of participants recognized the product used in the game (n=769)



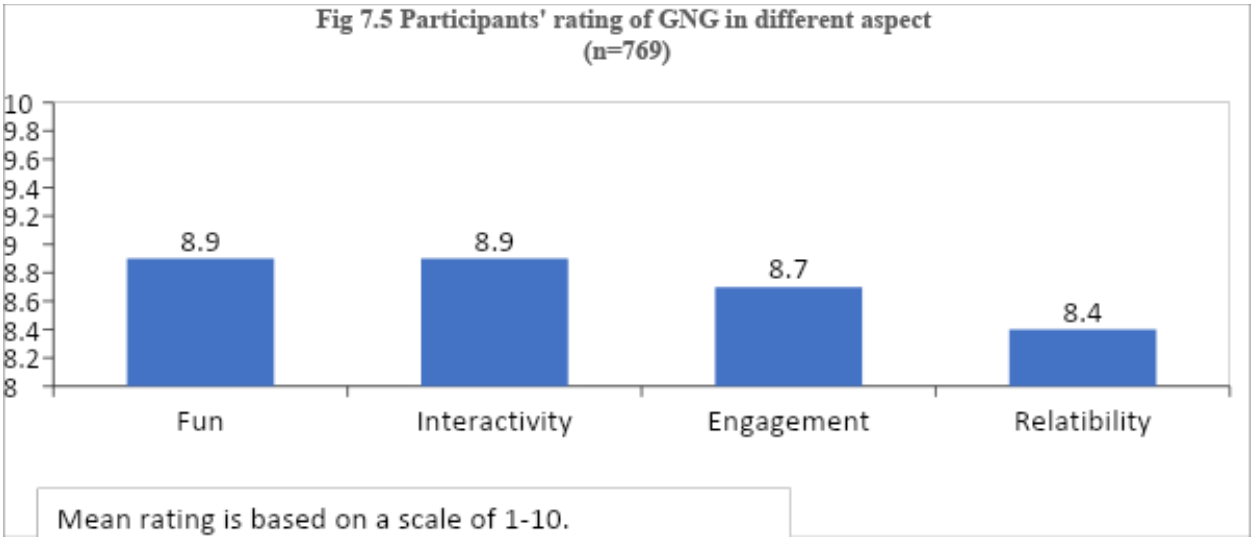
n = The girls in treatment group (769)



n= The girls in treatment group (769)

Among game participants, half of the girls uninstalled the game. The major reasons for uninstallation are: finishing the game (42%), lack of application storage space (37%), and sharing the device with others (32%). Apart from that, some participants also reported lack of mobile data (17%) and privacy (20%) as a reason for uninstallation.

All participants who played the game have rated the game for fun, interactivity, engagement, and relatability. The rating was done by the participants on a scale of 1 to 10. As shown in the figure 7.5, all four aspects were rated between 8 and 9.



The quantitative survey showed 51% of the treatment group have accessed the AskParo, chatbot, where players can ask questions related to in-game topics. Among the users, three-fifths rated the chatbot 10 out of 10. During the qualitative in-depth interview, participants explained their experience with AskParo helped them to seek more information

about menstrual hygiene products. Another participant stated more generally that GNG increased her confidence.

I – "You liked this chat bot?"
R – "Yes, in that, if you cannot ask mom, dad or family, then you can ask questions in it, then any answer to that also comes from there, like, whatever answers come in it about Tampons etc., then that. Not everyone could tell and even after not understanding the above, even after forgetting it, we can ask it again, repeat it and ask questions about it."

……. [Participant X aged 17 years, Patna]

I - Tell me what topics were discussed in this.
R - Periods, career, contraception, marriage, and job were discussed openly.

……. [Participant W aged 16 years, Jaipur]

R: Yes. By playing the game, I have developed confidence.
R: Earlier, I used to be very scared, and I had a fear that nobody would be by my side, but from the time I played this game, I developed self-confidence…….

……. [Participant Z aged 15 years, Delhi]

Most girls felt that GNG provided a non-judgmental platform to explore their doubts. Most of them felt that they were like Nisha in many aspects; almost all girls (92%) wanted to become like her and wanted to assert their opinions confidently. Nearly all girls have explored the apps through in-game linkages, and some have started using them. Most of the mobile period trackers are new users of cycle beads who track their menstrual cycle. They elucidated in quotations below the game has enhanced their learning holistically. The uptake of the DTC approach is in its early stages, especially in the target demographic for GNG. This may explain why while reported learning and awareness was high, utilization of some applications and products remained lower. It is possible that other barriers remain in translating knowledge to practice, especially for girls who are just learning to navigate situations regarding personal agency. GNG has the potential to increase knowledge and confidence to the point that players are more equipped to take steps to implement changes for physical health and making life decisions. Gaining knowledge is a critical step in advancing in these milestones of adolescence. As knowledge and attitudes are key barriers to building this personal agency, GNG's demonstrated efficacy in improving these aspects of daily life marks it as a practical and efficacious tool in advancing personal agency among the target population.

I: What did you learn from this game?
R: How to keep my health correctly, how to use the products, how to use new types of products, how to communicate with people, how to protect myself.
R: To convince the family of my career.
R: To convince my family to delay my marriage.
R: Method to express my thoughts to my boyfriend.

[Participant Q aged 15 years, Jaipur]

I - Can you give any suggestions to make this game better?
R - This game should be spread as much as possible so that every girl has information about it while sitting at home. In today's era, girls do not go out of the house much, and most of the boys are kept out of the house, and girls are kept out of the house. They are not allowed to go out, girls will not go out of the house, and it could be that they are getting information about all these things from some app and if they do not have a mobile phone and if their parents will not buy it and she is not able to meet the expenses of the house on anyone's advice.

[Participant F aged 18 years, Patna]

7.6. Summary

Results of the OE revealed that targets as defined by the IRs (see chapter 1) were achieved, as participants in the treatment group expressed significant improvements in: 1) knowledge of FP/RH care, in terms of awareness of fertility days and comprehensive knowledge of contraception, 2) attitudes and confidence in decision-making for contraceptive use and accessing DTC products and information, and 3) assertion of self-identity and self-efficacy. Many of these improvements were statistically significant compared to the control group, and further analyses indicated playing GNG as a key factor in improved scores in indicators. In addition to the metrics regarding outcome indicators, results also reveal that GNG met goals of being relatable and fun to the target audience, which would encourage girls to play the game. Almost 90% of the girls who started playing GNG completed all levels, which shows that the game was enjoyed by participants. Most respondents reported that they admired the Nisha character and aspire to be like her in the future. Combining relatable characters with realistic and interesting scenarios led to engaging gameplay that effectively conveyed new knowledge of health practices and relationship options while challenging stigmatizing norms and providing detailed information through DTC links. After playing GNG, girls are more likely to access products and links and search for queries online. The OE has demonstrated GNG's efficacy in achieving its targets of increasing knowledge

and confidence in matters related to promoting health and self-agency among the target population.

Learning and observations

GNG is one of its kind in the spectrum of game-based learning. This avatar gameplay has enriched participants across various socio-demographic characteristics, demonstrating its efficacy throughout the intervention group participants who played the game. This uniformity can be attributed to the target group's homogeneity, marked by smartphone access, school-going, unmarried status, and proficiency in traditional Hindi (Devanagari script) and Hindi written in the Latin alphabet (Hinglish).

Although GNG was directly linked to improved outcomes in the treatment group, certain indicators also improved in the control group as well from baseline to follow up, such as the understanding of contraceptive methods and agency. This may be due to the diffusion of information to the target group, learning from other sources during the time between the surveys, the short time interval between baseline and endline. Additionally, the survey at follow-up used similar questions as in baseline, which could have triggered the girls in control group to acquire knowledge on contraceptive methods and other domains from various sources.

Throughout implementation of the RCT, some noticeable challenges were encountered by both the program facilitators and the field investigators. Due to the school timings and board examination, field investigators conducted interviews in early morning and evening hours as per convenience of the participants.

Further, the game has linkages at all levels for providing detailed information on menstrual hygiene products, fertility awareness, menstrual period tracking, legal measures, and helpline numbers. These features seem to have resulted in slow progression in gameplay for a few participants, and a few couldn't come back to the main game. The game played at a slow pace and girls needed spontaneous encouragement from program facilitators to complete the game through Level 5. Also, participant's overall level of engagement with GNG was restricted, as many expressed their intention to uninstall it upon completing all levels of the game. The participants stated that the GNG app consumed significant space on their devices. It is worth noting that most girls were attending school and did not have access to smartphones all the time, and many girls shared these devices with family members. Despite these challenges, girls still gained significant knowledge from the game. As the game gains popularity, girls will hopefully continue receiving nudges to download and play the game through other sources, such as friends and media. Findings of the OE will inform continued analysis of GNG and development of future games for health and wellbeing.

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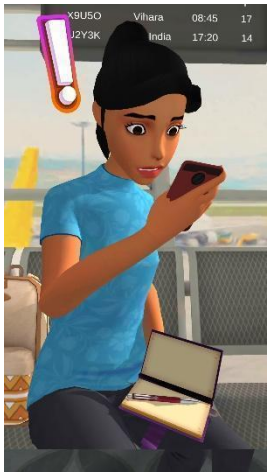
Annex 1. Encouragement design for a ten-week intervention for GNG evaluation

Week	Content and creatives for encouragement on Phone and WhatsApp	Intended Output
1	*Introduction to the game and weblink to download the game from the Google Play Store.* *https://play.google.com /store/apps/details? id=com. gameofchoicenotchance.gonisha go&hl=en_IN&gl=US* 	- Rapport developed with participants. - Link for downloading and installation of the game. - Encouragement to download the game. - The participants are reminded to always play the game using the same profile.
2	*Promoting content of the game – travel, themes, and storyline.* *INSTALL GO NISHA GO GAME (if required)* *https://play.google.com /store/apps/details? id=com. gameofchoicenotchance.gonisha go&hl=en_IN&gl=US* 	- Encouragement to download and play Level 1. - Download the game (for participants who have not installed the game. - Guidance for technical support and installation if required. - The participants are reminded to always play the game using the same profile.

Week	Content and creatives for encouragement on Phone and WhatsApp	Intended Output
3	*Continued promotion of storyline and new characters.* 	- Encouragement to complete Level 1 if downloaded. - Download the game for participants who have not installed the game. - Guidance for technical support and installation if required and any other queries or challenges. - The participants are reminded to always play the game using the same profile.
4	*Teaser and encouragement for Level 2.* 	- Encouragement to complete challenges in Levels 1 and 2. - Guidance for technical support and installation if required and any other queries or challenges. - The participants are reminded to always play the game using the same profile.

Week	Content and creatives for encouragement on Phone and WhatsApp	Intended Output
5	*Promoting DTC in-game links for menstruation hygiene management and in-game chat-bot – Ask Paro* 	- Encouragement to complete challenges in Level 3. - Promote playing Levels 1 and 2 for those who have not completed previous levels. - Players feel confident to explore the chatbot. - Guidance for technical support and installation if required and any other queries or challenges. - The participants are reminded to always play the game using the same profile.
6	*Encouragement to play Super Nisha to assess intended learning outcomes and introduction to new characters.* 	- Encouragement to complete Level 4 and previous levels if they have not played them. - Players have clicked on in-game linkages to products, services, and information. - Players feel confident to utilize the chatbot. - Guidance for technical support and installation if required and any other queries or challenges. - The participants are reminded to always play the game using the same profile.

Week	Content and creatives for encouragement on Phone and WhatsApp	Intended Output
7	*Encouragement to play Level 5 and introduction to new characters and challenges.* 	- Encouragement to complete Level 5 and previous levels if they have not played them. - Players feel confident to explore the chatbot. - Players share the experience and any technical issues to access in-game linkages. - The participants are reminded to always play the game using the same profile.
8	*Encouragement to complete all levels and replay the game.* 	- Encouragement to complete level 5 and previous levels if they have not played them. - Participants have explored various in-game linkages, the chatbot, and played mini-games. - The participants are reminded to always play the game using the same profile.

Week	Content and creatives for encouragement on Phone and WhatsApp	Intended Output
9	*Explore external product linkages for a fertility awareness app and improve their score through replay.* 	- Encouragement to complete Level 5 and previous levels if they have not played them. - Participants have explored various in-game linkages, the chatbot, and played mini-games. - The participants are reminded to always play the game using the same profile.
10	*Encouragement to play the game and ensure that they have played all levels at least once.* 	- Encouragement to complete Level 5 and previous levels if they have not played them. - Participants have explored various in-game linkages, explored the chatbot and played mini-games. - The participants are reminded to always play the game using the same profile.

Annex 2: Sample size calculation for outcome evaluation study

Indicator	p1	p2	Power	Detect change	Lost to follow-up	Sample size	Per city
Contraceptive knowledge*	55%	62%	80%	7%	30%	1950	650
Fertility awareness**	11%	16%	80%	5%	30%	1950	650
Menstrual knowledge***	78%	84%	80%	6%	30%	1950	650

*Awareness of modern spacing contraceptive methods (IUD, Pill, Condom) according to NFHS-5 among unmarried adolescent girls in urban areas.
**Fertility awareness (Knowledge of the ovulatory cycle) according to NFHS-5 among unmarried adolescent girls in urban areas.
***Menstrual hygiene awareness (using sanitary napkins) according to NFHS-5 among unmarried adolescent girls in urban areas.

Annex 3: Index on menstrual attitude

The menstrual attitude index is measured using ten statements (mentioned below) asked to all the adolescent girls during baseline and follow-up survey. These statements are about the attitudes/practices regarding menstrual health and hygiene.
These statements are as follows:

Statements

1. *Getting periods is a normal part of being a woman.*
2. *Getting periods is healthy.*
3. *Your period blood is dirty.*
4. *You should not attend school when you have your periods.*
5. *You should not attend religious services when you have your period.*
6. *You should not play sports when you have your period.*
7. *You should not wear certain clothes if you have your period.*
8. *Girls should not be embarrassed to tell someone if they have their periods.*
9. *There are some foods you should not eat when you have your period.*
10. *A girl with her period should not enter the kitchen.*

The statements were asked on five-point scales as strongly agree, agree, neutral, disagree and strongly disagree. These statements can be divided into two types. One is a positive attitude that suggests the agreement (strongly agree/agree) is a healthy/acceptable attitude (Statements 1,2,8). These statements were then converted to a binary variable with agreement (agree and strongly agree) as "1" and disagreement (disagree and strongly disagree) and neutral as "0". Similarly, statements related to negative attitudes that suggest disagreement (strongly disagree or disagree) are healthy/acceptable attitudes (statement

3,4,5,6,7,9,10). These statements were then converted to a binary variable with disagreement (disagree and strongly disagree) as "1" and agreement (agree and strongly agree) and neutral as "0". The recorded variables were added to get the total menstrual attitude index which lies between 0 and 10. The internal consistency of the index, as measured by Cronbach's Alpha, was high (α =0.73 in baseline and 0.67 in follow-up). The value of the index ranged from 0 indicating least acceptable attitudes, to 10 indicating most acceptable attitudes. In this report the menstrual attitude Index is used as a continuous outcome variable.

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Annex 4: Result of difference-in-difference analysis of key outcome indicators

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls aware about different menstrual hygiene products							
Locally prepared napkins	Level 2	63.6	65.4	64.1	87.6	21.7	<0.001
Sanitary napkins	Level 2	93.9	97.2	94.7	98.4	0.4	0.770
Cloth	Level 2	85.7	86.9	84.5	95.7	10.0	<0.001
Tampons	Level 2	18.3	20.8	19.4	85.8	64.0	<0.001
Menstrual cup	Level 2	20.2	25.8	22.2	88.0	60.2	<0.001
Reusable pads	Level 2	27.2	32.8	24.4	87.0	57.0	<0.001
Girls using menstrual hygiene products	Level 2	84.3	86.6	81.5	88.5	4.6	0.062
Girls track /keep record of their menstrual periods	Level 2	20.7	23.6	24.6	40.3	12.8	<0.001
Girls track their menstrual period through mobile application	Level 2	5.9	8.2	13.8	30.5	14.3	0.003

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls disagreed (strongly disagree/disagree) that 'period blood is dirty'	Level 2	15.9	14.2	16.6	22.6	7.7	0.003
Girls agreed (strongly agree/agree) that "girls should not be embarrassed to tell someone if they have their periods"	Level 2	70.7	69.9	75.0	64.4	-9.9	0.002
Girls know about fertility awareness (Halfway between two periods)	Level 2	2.9	9.6	3.9	23.5	12.9	<0.001
Girls who ever troubled to obtain menstrual hygiene products	Level 2	22.3	15.4	20.9	20.2	6.2	0.025
Girls who bought sanitary napkins online	Level 2	5.6	5.8	5.5	18.7	13.0	<0.001
Girls confident to access menstrual product online	Level 2	74.7	87.0	74.6	94.3	7.3	0.004
Girls confident to discuss about menstrual health with others	Level 2	71.8	87.1	72.4	96.0	8.3	0.001
Girls who know what they want to pursue as career	Level 1	93.8	88.6	96.5	89.7	-1.6	0.391
Girls who are doing anything to pursue their career	Level 1	56.0	53.5	57.0	58.8	4.3	0.237
Girls who are aware about CV	Level 1	35.5	52.3	37.1	72.8	19.0	<0.001
Girls who are aware about internship	Level 1	16.8	34.7	19.9	69.1	31.3	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls aware about legal age of marriage for girls (18)	Level 1	59.2	60.2	56.2	59.0	1.8	0.599
Girls aware about legal age of marriage for boys (21)	Level 1	78.0	78.2	75.2	81.1	5.8	0.043
Girls who believed 'girls should make decisions for themselves'	Level 1	83.5	88.1	83.5	93.4	5.2	0.023
Girls who believed that 'girls should manage their own money'	Level 1	88.4	92.8	87.8	97.7	5.5	0.004
Girls will talk to their parents if their parents did not like what you are wearing	Level 1	35.1	34.3	37.7	54.4	17.5	<0.001
Girls who believed 'girls can choose when to marry'	Level 1	77.0	77.8	77.1	90.5	12.6	<0.001
Girls who believed 'girls should be financially independent'	Level 1	85.8	88.5	82.1	93.4	8.6	<0.001
Girls who disagreed that 'girls can work only if their husband allows'	Level 1	38.8	43.6	42.0	51.6	4.8	0.161
Girls who believe that they should select their marriage partners	Level 1	30.9	39.5	32.0	49.0	8.4	0.011

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls who believe that they can talk to their parents when they were asked to marry a person whom they do not want to marry	Level 1	73.3	67.8	70.6	77.2	12.1	0.011
Girls who bought products online							
Clothes	Level 1	45.6	64.2	50.1	74.5	5.8	0.080
Makeup (cosmetics)	Level 1	25.8	30.7	25.7	42.7	11.9	<0.001
Health products	Level 1	6.9	7.9	8.5	20.4	11.0	<0.001
Hair products	Level 1	9.3	10.9	12.6	19.0	4.8	0.037
Pain relievers medicines	Level 1	3.0	1.1	3.4	6.5	5.1	<0.001
Medicine	Level 1	2.3	2.2	3.6	6.6	3.1	0.015
Girls ever sought information from frontline workers	Level 1	22.5	25.4	24.8	34.6	6.8	0.024
Girls ever sought health advice online	Level 1	10.0	18.1	13.0	28.5	7.4	0.004
Girls who perceive teasing, catcalling, stalking etc. is not at all right							

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Friend	Level 1	93.8	94.5	92.6	92.8	-0.5	0.772
Boyfriend	Level 1	96.2	94.7	96.5	94.8	-0.2	0.898
Other known people	Level 1	97.7	98.2	97.1	97.4	-0.2	0.870
Unknown People	Level 1	98.7	99.1	97.7	98.0	0.0	0.962
Any of the above	Level 1	91.4	90.5	89.5	88.8	0.2	0.918
Girls confident to say no to a sexual act to their boyfriend	Level 3	73.8	87.1	74.2	95.6	8.1	0.002
Girls confident to say no to a sexual act if not willing to do to their boyfriend	Level 3	74.5	87.8	74.5	96.6	8.7	0.001
Girls confident to use condom when her boyfriend is not willing to	Level 3	73.4	86.0	73.9	93.3	6.7	0.012
Girls think they can change their minds anytime about touching if they don't want it.	Level 3	72.5	83.2	71.1	90.3	8.5	0.002
Girls think they can change their minds anytime about kissing if they don't want it.	Level 3	65.0	81.4	64.3	86.8	6.1	0.041

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls think they can change their minds anytime about sex if they don't want it.	Level 3	65.7	80.4	65.3	88.3	8.4	0.005
Girls think their boyfriend should always take consent for touching.	Level 3	44.3	53.9	45.3	67.6	12.8	<0.001
Girls think their boyfriend should always consent to kissing.	Level 3	47.6	57.9	47.3	70.9	13.4	<0.001
Girls think their boyfriend should always consent to sex.	Level 3	49.6	58.8	47.6	70.9	14.1	<0.001
Girls aware about the legal age of consensual sex	Level 3	38.5	39.3	34.6	60.2	24.8	<0.001
Girls aware about POCSO act	Level 3	11.9	20.5	11.8	52.8	32.4	<0.001
Girls think that after having sex with their partner one time, they can refuse to have sex with him the next time. (Ability to refuse sex)	Level 3	42.2	58.9	40.1	77.0	20.2	<0.001
Girls aware about women helpline number	Level 3	43.0	63.0	41.8	86.4	24.5	<0.001
Girls aware about cell for reporting violence related incidents	Level 3	39.8	58.8	36.9	84.4	28.4	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls will talk to a health service provider if they come across any contraception-related issues in next 6 months	Level 4	13.0	25.2	12.5	40.6	15.9	<0.001
Girls will talk to a health service provider if they come across any doubts about contraception-related issues in next 6 months	Level 4	13.7	24.4	12.3	39.4	16.5	<0.001
Girls aware about different contraceptive methods (spontaneous)							
Condom	Level 4	51.4	77.5	52.1	84.2	6.0	0.058
ECP	Level 4	8.3	14.7	10.3	35.5	18.9	<0.001
Injectables	Level 4	21.8	14.0	24.8	37.5	20.4	<0.001
OCP	Level 4	19.5	26.0	21.7	45.5	17.3	<0.001
IUD	Level 4	13.3	23.2	11.4	45.8	24.5	<0.001
SDM	Level 4	1.1	3.0	1.1	14.4	11.3	<0.001
Girls aware about different contraceptive methods (prompted)							

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Condom	Level 4	43.2	81.9	46.3	92.1	7.1	0.018
ECP	Level 4	34.9	21.6	36.8	53.9	30.5	<0.001
Injectables	Level 4	36.3	39.1	39.7	69.6	27.1	<0.001
OCP	Level 4	40.8	58.7	46.8	86.8	22.1	<0.001
IUD	Level 4	30.9	43.0	32.1	71.4	27.2	<0.001
SDM	Level 4	13.5	9.4	13.5	35.1	25.6	<0.001
Girls aware about different contraceptive methods (prompted + unprompted)							
Condom	Level 4	61.2	88.3	63.7	95.9	5.2	0.061
ECP	Level 4	37.2	28.8	39.3	63.4	32.5	<0.001
Injectables	Level 4	42.8	40.6	47.0	72.4	27.5	<0.001
OCP	Level 4	45.7	60.1	51.5	88.0	22.0	<0.001
IUD	Level 4	33.3	44.5	33.8	73.1	28.1	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
SDM	Level 4	13.5	10.5	13.5	37.6	27.1	<0.001
Girls aware about the practice/ use of Oral contraception pills	Level 4	18.4	20.4	13.5	38.3	22.8	<0.001
Girls aware about the practice/ use of Emergency contraception pills	Level 4	7.8	22.0	5.7	32.9	13.0	0.007
Girls aware about the practice/ use of condom	Level 4	28.3	21.8	26.0	35.6	16.1	<0.001
Girls aware about the practice/ use of IUD/ Copper T	Level 4	2.1	10.8	1.1	17.0	7.2	0.043
Girls aware about the practice/ use of injectables	Level 4	2.8	12.4	5.2	19.4	4.7	0.186
Girls know that one can obtain contraceptives through online, e-commerce portals.	Level 4	2.5	9.3	3.8	18.5	7.9	<0.001
Girls who bought contraception products online	Level 4	4.0	0.6	4.9	2.0	0.4	0.741
Girls opinionated that girls should be responsible for deciding to use contraception	Level 4	8.3	13.1	10.3	10.6	-4.6	0.035
Girls opinionated that girls should decide which contraception to use.	Level 4	8.3	12.4	7.9	9.6	-2.4	0.247

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	GNG game played till:	Control (%)		Intervention (%)		Net Effect (%)	p value
		Baseline	Follow-up	Baseline	Follow-up		
Girls opinionated that 'both partners' should procure the contraception.	Level 4	67.1	59.5	65.8	68.5	10.3	0.002
Girls know that condoms can prevent STDs	Level 4	20.0	25.9	20.0	42.3	16.4	<0.001
Girls will talk and convince their partners if they don't want to use any contraception (in the future when they will have a sexual relationship)	Level 4	21.8	42.9	21.8	51.7	8.7	0.007

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Annex 5: Adjusted odd ratios assessing the effect of GNG game on key outcome indicators (GEE analysis)

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls who received information or services from health providers	Didn't received	Level 1	1.47 (1.12-1.93)	0.006
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	Level 1	1.75 (1.25-2.46)	0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Talk to friends/family, search online, or don't do anything	Level 2	2.15 (1.51-3.06)	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	Level 2	1.87 (1.31-2.69)	0.001
Awareness about number of menstrual hygiene products	Continuous	Level 2	**7.61 (6.62-8.76)**	<0.001
Awareness of locally prepared napkins	No	Level 2	3.69 (2.65-5.14)	<0.001
Awareness of sanitary napkins	No	Level 2	1.53 (0.68-3.43)	0.307

[9] Played atleast level-1: 809; Played atleast level-2:780; Played atleast level-3:750; Played atleast level-4:740; Played all 5 levels:734

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Awareness of tampons	No	Level 2	23.48 (16.68-33.05)	<0.001
Awareness of menstrual cup	No	Level 2	20.90 (15.02-29.09)	<0.001
Awareness of reusable pads	No	Level 2	16.50 (11.86-22.95)	<0.001
Awareness about number of menstrual hygiene products[1]	Continuous	Level 2	**7.46 (6.49-8.58)**	<0.001
Awareness of locally prepared napkins[1]	No	Level 2	3.58 (2.57-5.01)	<0.001
Awareness of sanitary napkins[1]	No	Level 2	1.48 (0.66-3.34)	0.343
Awareness of tampons[1]	No	Level 2	23.26 (16.52-32.76)	<0.001
Awareness of menstrual cup[1]	No	Level 2	20.66 (14.85-28.75)	<0.001
Awareness of reusable pads[1]	No	Level 2	16.35 (11.75-22.74)	<0.001
Girls using menstrual hygiene products	Non-hygienic (cloth)	Level 2	1.39 (0.98-1.98)	0.067
Girls using menstrual hygiene products[2]	Non-hygienic (cloth)	Level 2	1.42 (1.00-2.02)	0.053

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls track /keep record of their menstrual periods	No	Level 2	1.76 (1.29-2.41)	<0.001
Girls track their menstrual period through mobile application	No	Level 2	1.79 (0.70-4.55)	0.223
Girls track their menstrual period through mobile application[3]	No	Level 2	1.83 (0.71-4.73)	0.212
Girls disagreed (strongly disagree/disagree) that 'period blood is dirty'	Strongly agree/agree/neutral	Level 2	1.69 (1.22-2.33)	0.001
Girls agreed (strongly agree/agree) that "girls should not be embarrassed to tell someone if they have their periods"	Strongly disagree/ disagree/ neutral	Level 2	0.62 (0.47-0.83)	0.001
Girls know about fertility awareness (Halfway between two periods)	Don't aware	Level 2	2.19 (1.20-3.99)	0.010
Girls know about fertility awareness (Halfway between two periods)[4]	Don't aware	Level 2	2.17 (1.19-3.94)	0.011
Girls who ever troubled to obtain menstrual hygiene products	No	Level 2	1.51 (1.08-2.10)	0.015
Girls who bought sanitary napkins online	No	Level 2	3.89 (2.36-6.41)	<0.001
Girls confident to access menstrual product online	Not confident	Level 2	2.47 (1.63-3.76)	<0.001
Girls confident to discuss about menstrual health with others	Not confident	Level 2	3.47 (2.18-5.53)	<0.001
Girls using cloth in menstruation	No	Level 2	0.69 (0.48-0.99)	0.045
Girls using cloth in menstruation[2]	No	Level 2	0.68 (0.47-0.97)	0.035

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls who know what they want to pursue as career	Unsure	Level 1	0.61 (0.37-1.03)	0.063
Girls who are doing anything to pursue their career	No	Level 1	1.18 (0.89-1.57)	0.243
Girls who are aware about CV	No	Level 1	2.33 (1.78-3.05)	<0.001
Girls who are aware about CV[5]	No	Level 1	2.34 (1.79-3.06)	<0.001
Girls who are aware about internship	No	Level 1	3.53 (2.61-4.78)	<0.001
Girls who are aware about internship[5]	No	Level 1	3.53 (2.61-4.78)	<0.001
Girls aware about legal age of marriage for girls (18)	Don't know	Level 1	1.08 (0.85-1.36)	0.538
Girls aware about legal age of marriage for girls (18)[6]	Don't know	Level 1	1.08 (0.85-1.36)	0.538
Girls aware about legal age of marriage for boys (21)	Don't know	Level 1	1.41 (1.03-1.93)	0.032
Girls aware about legal age of marriage for boys (21)[6]	Don't know	Level 1	1.41 (1.03-1.93)	0.032
Girls who believed 'girls should make decisions for themselves'	Disagree/can't say	Level 1	1.91 (1.26-2.89)	0.002
Girls who believed that 'girls should manage their own money'	No	Level 1	3.46 (1.88-6.35)	<0.001
Girls will talk to their parents if their parents did not like what you are wearing	Other responses (change cloth immediately or wear extra cloth until out)	Level 1	2.06 (1.57-2.70)	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls who believed 'girls can choose when to marry'	Disagree/can't say	Level 1	2.76 (1.95-3.91)	<0.001
Girls who believed 'girls should be financially independent'	Disagree/can't say	Level 1	2.45 (1.61-3.73)	<0.001
Girls who disagreed that 'girls can work only if their husband allows'	Agree/can't say	Level 1	1.21 (0.94-1.56)	0.142
Girls who believe that they should select their marriage partners	Other should select	Level 1	1.41 (1.10-1.81)	0.006
Girls who believe that they can talk to their parents when they were asked to marry a person whom they do not want to marry	No	Level 1	1.85 (1.38-2.48)	<0.001
Girls who bought products online				
Clothes	No	Level 1	1.37 (1.07-1.74)	0.011
Makeup (cosmetics)	No	Level 1	1.69 (1.30-2.20)	<0.001
Health products	No	Level 1	2.44 (1.55-3.86)	<0.001
Hair products	No	Level 1	1.37 (0.93-2.01)	0.111
Pain relievers medicines	No	Level 1	5.71 (2.41-13.58)	<0.001
Medicine	No	Level 1	1.99 (0.93-4.26)	0.078
Girls ever sought information from frontline workers	No	Level 1	1.37 (1.02-1.84)	0.039
Girls ever sought health advice online	No	Level 1	1.35 (0.94-1.95)	0.109

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls who perceive teasing, catcalling, stalking etc. is not at all right				
Friend	Alright	Level 1	0.91 (0.53-1.54)	0.716
Boyfriend	Alright	Level 1	0.94 (0.50-1.77)	0.856
Other known people	Alright	Level 1	0.89 (0.37-2.14)	0.793
Unknown People	Alright	Level 1	0.80 (0.25-2.52)	0.702
Girls confident to say no to a sexual act to their boyfriend	Not confident	Level 3	3.18 (2.06-4.93)	<0.001
Girls confident to say no to a sexual act if not willing to do to their boyfriend	Not confident	Level 3	3.92 (2.42-6.35)	<0.001
Girls confident to use condom when her boyfriend is not willing to	Not confident	Level 3	2.21 (1.47-3.30)	<0.001
Girls think they can change their minds anytime about touching if they don't want it.	Don't agree/can't say	Level 3	2.02 (1.40-2.92)	<0.001
Girls think they can change their minds anytime about kissing if they don't want it.	Don't agree/can't say	Level 3	1.56 (1.12-2.16)	0.008
Girls think they can change their minds anytime about sex if they don't want it.	Don't agree/can't say	Level 3	1.89 (1.36-2.63)	<0.001
Girls think their boyfriend should always take consent for touching.	Not always (only first time, never, depends)	Level 3	1.73 (1.30-2.30)	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls think their boyfriend should always consent to kissing.	Not always (only first time, never, depends)	Level 3	1.81 (1.36-2.41)	<0.001
Girls think their boyfriend should always consent to sex.	Not always (only first time, never, depends)	Level 3	1.86 (1.40-2.47)	<0.001
Girls aware about the legal age of consensual sex	Don't know	Level 3	2.82 (2.14-3.73)	<0.001
Girls aware about POCSO act	Don't know	Level 3	4.43 (3.08-6.37)	<0.001
Girls think that after having sex with a partner one time, they can refuse to have sex with him the next time. (Ability to refuse sex)	No/ don't know	Level 3	2.56 (1.93-3.41)	<0.001
Girls aware about women helpline number	No	Level 3	3.99 (2.89-5.50)	<0.001
Girls aware about cell for reporting violence related incidents	No	Level 3	4.31 (3.17-5.86)	<0.001
Girls will talk to a health service provider if they come across any contraception-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	Level 4	2.14 (1.51-3.03)	<0.001
Girls will talk to a health service provider if they come across any doubts about contraception-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	Level 4	2.32 (1.62-3.30)	<0.001
Girls aware about different contraceptive methods (spontaneous)				

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Condom	No	Level 4	1.51 (1.12-2.05)	0.007
ECP	No	Level 4	2.55 (1.69-3.86)	<0.001
Injectables	No	Level 4	3.12 (2.24-4.34)	<0.001
OCP	No	Level 4	2.10 (1.55-2.85)	<0.001
IUD	No	Level 4	3.36 (2.36-4.79)	<0.001
SDM	No	Level 4	5.17 (1.91-14.00)	0.001
Girls aware about different contraceptive methods (prompted)				
Condom	No	Level 4	2.29 (1.57-3.32)	<0.001
ECP	No	Level 4	4.03 (2.99-5.43)	<0.001
Injectables	No	Level 4	3.15 (2.38-4.15)	<0.001
OCP	No	Level 4	3.67 (2.66-5.06)	<0.001
IUD	No	Level 4	3.17 (2.40-4.20)	<0.001
SDM	No	Level 4	5.30 (3.60-7.79)	<0.001
Girls aware about different contraceptive methods (prompted+ spontaneous)				

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Condom	No	Level 4	2.83 (1.81-4.41)	<0.001
ECP	No	Level 4	4.00 (2.99-5.35)	<0.001
Injectables	No	Level 4	3.28 (2.50-4.31)	<0.001
OCP	No	Level 4	3.90 (2.81-5.41)	<0.001
IUD	No	Level 4	3.36 (2.53-4.46)	<0.001
SDM	No	Level 4	5.24 (3.58-7.67)	<0.001
Girls aware about different contraceptive methods (spontaneous + prompted)				
Condom[7]	No	Level 4	2.81 (1.80-4.40)	<0.001
ECP[77]	No	Level 4	3.98 (2.97-5.34)	<0.001
Injectables[7]	No	Level 4	3.26 (2.48-4.29)	<0.001
OCP[7]	No	Level 4	3.88 (2.80-5.39)	<0.001
IUD[7]	No	Level 4	3.35 (2.52-4.44)	<0.001
SDM[7]	No	Level 4	5.22 (3.57-7.65)	<0.001
Girls aware about the practice/ use of Oral contraception pills	No	Level 4	4.63 (2.84-7.56)	<0.001

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value
Girls aware about the practice/ use of Emergency contraception pills	No	Level 4	5.64 (2.50-12.75)	<0.001
Girls aware about the practice/ use of condom	No	Level 4	2.38 (1.62-3.49)	<0.001
Girls aware about the practice/ use of IUD/ Copper T	No	Level 4	5.48 (1.01-29.81)	0.049
Girls aware about the practice/ use of injectables	No	Level 4	1.57 (0.58-4.21)	0.371
Girls know that one can obtain contraceptives through online, e-commerce portals.	Don't know	Level 4	1.44 (0.77-2.66)	0.251
Girls who bought contraception products online	No	Level 4	2.48 (0.86-7.14)	0.093
Girls opined that girls should be responsible for deciding to use contraception	Others (boy/ both)	Level 4	0.62 (0.39-0.97)	0.036
Girls opined that girls should decide which contraception to use.	Others (boy/ both)	Level 4	0.79 (0.49-1.27)	0.333
Girls opined that 'both partners' should procure the contraception.	Boy or girl independently	Level 4	1.58 (1.18-2.11)	0.002
Girls know that condoms can prevent STDs	No	Level 4	2.14 (1.57-2.92)	<0.001
Girls know that condoms can prevent STDs[8]	No	Level 4	2.13 (1.56-2.91)	<0.001
Girls will talk and convince their partners if they don't want to use any contraception (in the future when they will have a sexual relationship)	Do not convince (accept/ reject/ postponed)	Level 4	1.42 (1.04-1.94)	0.027

Girls who received information or services from health providers	Level 1	34.4	50.8	34.1	59.8	9.4	0.005
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Level 1	14.1	23.7	13.8	34.6	11.2	<0.001
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Level 2	11.1	20.9	11.7	37.5	16.0	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Level 2	10.6	19.2	12.4	34.7	13.7	<0.001

Key outcome indicators	Reference value	GNG game played till:[9]	Adjusted odd ratio (95% CI)	p-value

Note: All indicators are adjusted to key socio-demographic indicators such as age, education of girls, mothers education, religion, caste, household poverty status (BPL/non-BPL); [1] Adjusted for socio-demographic indicators and sought information from frontline worker; [2] Adjusted for socio-demographic indicators and menstrual health service received from health facility; [3] Adjusted for socio-demographic indicators and shared mobile holder; [4] Adjusted for socio-demographic indicators and safe sex awareness from facility;[5] Adjusted for socio-demographic indicators and ever worked; [6] Adjusted for socio-demographic indicators and female household head; [7] Adjusted for socio-demographic indicators and contraception awareness received from health facility; [8] Adjusted for socio-demographic indicators and STI/STD awareness received from health facility;

Annexure 2A: Difference in background characteristics of respondents from intent-to-treat v/s per-protocol approaches

Background Characteristics	Intent-to-treat follow-up sample (n=1880)	Per protocol follow-up sample (n=1697)	p value
Girls age (in years)			
15	25.9	26.0	0.855
16	22.5	22.7	
17	20.4	20.4	
18	19.7	19.6	
19	11.4	11.3	
Currently studying			
Yes	81.1	81.3	0.877
No	18.9	18.7	
Household with BPL card			
yes	19.0	19.9	0.484
no	81.0	80.1	
Ever attended any vocational training			
Yes	33.6	33.5	0.956
No	66.4	66.5	
Number of siblings			
0	2.8	2.7	0.904
1	18.1	18.6	
2	30.6	30.1	
3	24.0	24.0	
4+	24.4	24.7	
Parental education (10th standard and above)			
Father	27.9	27.9	1.000
Mother	3.6	3.5	0.896
Both	15.4	15.4	0.991
None	53.1	53.2	0.968
Caste			
SC	41.3	40.6	0.682
ST	16.3	16.9	0.610
Others	35.3	35.2	0.960
DK	7.1	7.2	0.889
Religion			
Hindu	85.1	84.5	0.615
Non-Hindu	14.9	15.5	

Annex 4A: ITT approach: Key outcome results using difference-in-difference analysis

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
Girls who received information or services from health providers	34.5	51.2	33.5	57.2	7.0	0.027
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	14.0	24.0	14.0	31.5	7.5	0.004
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	11.2	21.3	11.3	34.5	13.1	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	10.5	19.6	12.3	31.1	9.8	<0.001
Girls aware about different menstrual hygiene products						
Locally prepared napkins	63.4	65.9	64.4	81.9	15.0	<0.001
Sanitary napkins	93.7	97.2	94.9	98.4	0.0	0.979
Cloth	85.5	86.9	85.2	94.5	7.9	<0.001
Tampons	18.8	22.2	18.3	72.7	51.0	<0.001
Menstrual cup	20.5	27.3	20.9	75.5	47.9	<0.001
Reusable pads	27.2	33.9	23.4	75.6	45.4	<0.001
Girls using menstrual hygiene products	84.1	86.7	83.0	89.1	3.5	0.127
Girls track /keep record of their menstrual periods	21.0	24.3	24.2	35.0	7.4	0.010
Girls track their menstrual period through mobile application	6.2	10.0	13.5	28.9	11.6	0.013
Girls disagreed (strongly disagree/disagree) that 'period blood is dirty'	16.3	14.3	15.2	21.2	8.0	0.001
Girls agreed (strongly agree/agree) that "girls should not be embarrassed to tell someone if they have their periods"	70.7	69.5	74.1	65.5	-7.3	0.014

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
Girls know about fertility awareness (Halfway between two periods)	2.8	9.8	3.8	20.5	9.8	<0.001
Girls who ever troubled to obtain menstrual hygiene products	22.2	15.6	20.7	18.9	4.8	0.064
Girls who bought sanitary napkins online	5.9	6.5	5.2	15.7	9.9	<0.001
Girls confident to access menstrual product online	74.6	87.1	74.8	93.1	5.9	0.016
Girls confident to discuss about menstrual health with others	71.8	87.1	72.6	94.8	7.0	0.004
Girls who know what they want to pursue as career	93.9	88.7	95.8	87.8	-2.8	0.12
Girls who are doing anything to pursue their career	56.3	54.0	56.1	57.4	3.5	0.317
Girls who are aware about CV	35.5	52.4	36.2	68.0	14.8	<0.001
Girls who are aware about internship	16.9	35.3	19.2	63.0	25.4	<0.001
Girls aware about legal age of marriage for girls (18)	58.7	60.1	56.5	58.8	1.0	0.756
Girls aware about legal age of marriage for boys (21)	78.1	78.5	75.7	80.2	4.1	0.129
Girls who believed 'girls should make decisions for themselves'	82.9	88.0	83.8	93.4	4.6	0.034
Girls who believed that 'girls should manage their own money'	88.4	92.8	87.7	97.5	5.4	0.003
Girls will talk to their parents if their parents did not like what you are wearing	35.5	34.8	37.4	50.6	13.9	<0.001
Girls who believed 'girls can choose when to marry'	76.9	77.7	76.9	88.1	10.4	<0.001
Girls who believed 'girls should be financially independent'	85.5	88.2	82.8	93.7	8.1	<0.001
Girls who disagreed that 'girls can work only if their husband allows'	38.7	43.7	39.9	49.9	5.1	0.117
Girls who believe that they should select their marriage partners	30.9	39.6	31.8	47.6	7.2	0.022

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
Girls who believe that they can talk to their parents when they were asked to marry a person whom they do not want to marry	73.4	67.8	70.8	75.7	10.5	<0.001
Girls who bought products online						
Clothes	45.8	64.6	48.0	70.1	3.3	0.295
Makeup (cosmetics)	26.5	31.6	24.6	38.9	9.2	0.002
Health products	7.4	8.5	8.0	17.8	8.7	<0.001
Hair products	9.8	11.3	12.0	17.3	3.8	0.079
Pain relievers medicines	2.9	1.3	3.5	5.5	3.6	0.002
Medicine	2.4	2.4	3.5	5.8	2.3	0.060
Girls ever sought information from frontline workers	22.8	26.3	24.1	32.2	4.6	0.109
Girls ever sought health advice online	10.3	18.9	11.8	24.9	4.5	0.061
Girls who perceive teasing, catcalling, stalking etc. is not at all right						
Friend	93.9	94.4	92.9	92.4	-1.1	0.511
Boyfriend	96.3	94.6	96.6	95.1	0.2	0.893
Other known people	97.8	98.2	97.3	97.3	-0.4	0.67
Unknown People	98.7	99.2	97.8	98.3	0.0	0.991
Any of the above	91.6	90.3	90.1	88.4	-0.5	0.814
Girls confident to say no to a sexual act to their boyfriend	73.8	87.2	76.0	94.9	5.6	0.020
Girls confident to say no to a sexual act if not willing to do to their boyfriend	74.4	88.0	75.9	95.7	6.2	0.008

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
Girls confident to use condom when her boyfriend is not willing to	73.3	86.0	75.1	92.2	4.4	0.079
Girls think they can change their minds anytime about touching if they don't want it.	72.4	83.1	72.4	89.7	6.7	0.010
Girls think they can change their minds anytime about kissing if they don't want it.	65.2	81.2	66.0	87.1	5.1	0.066
Girls think they can change their minds anytime about sex if they don't want it.	65.7	80.0	67.0	88.1	6.8	0.014
Girls think their boyfriend should always take consent for touching.	44.6	54.0	46.9	65.3	9.0	0.005
Girls think their boyfriend should always consent to kissing.	47.8	57.8	49.5	68.8	9.4	0.003
Girls think their boyfriend should always consent to sex.	49.7	59.1	50.0	69.7	10.3	0.001
Girls aware about the legal age of consensual sex	38.4	39.8	36.8	56.6	18.4	<0.001
Girls aware about POCSO act	11.9	20.9	12.2	46.0	24.8	<0.001
Girls think that after having sex with their partner one time, they can refuse to have sex with him the next time. (Ability to refuse sex)	42.4	58.8	42.7	74.1	15.0	<0.001
Girls aware about women helpline number	43.5	63.6	41.3	81.4	20.0	<0.001
Girls aware about cell for reporting violence related incidents	40.0	59.5	36.5	79.0	23.1	<0.001
Girls will talk to a health service provider if they come across any contraception-related issues in next 6 months	13.1	25.3	13.2	35.6	10.2	<0.001
Girls will talk to a health service provider if they come across any doubts about contraception-related issues in next 6 months	13.7	24.3	12.7	34.0	10.7	<0.001
Girls aware about different contraceptive methods (spontaneous)						

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
Condom	51.9	77.2	51.1	83.3	7.0	0.018
ECP	8.3	15.1	9.2	31.2	15.2	<0.001
Injectables	22.2	14.6	22.8	31.7	16.5	<0.001
OCP	19.9	26.5	19.7	42.9	16.6	<0.001
IUD	13.5	23.5	11.4	40.6	19.2	<0.001
SDM	1.2	3.2	1.2	11.7	8.5	<0.001
Girls aware about different contraceptive methods (prompted)						
Condom	43.6	82.0	45.4	91.1	7.3	0.009
ECP	35.6	22.5	34.7	47.8	26.2	<0.001
Injectables	36.7	39.9	38.1	62.4	21.1	<0.001
OCP	41.5	59.3	45.3	82.2	19.1	<0.001
IUD	31.4	43.7	31.0	64.5	21.2	<0.001
SDM	13.7	10.0	14.0	28.2	17.9	<0.001
Girls aware about different contraceptive methods (prompted + unprompted)						
Condom	61.8	88.3	61.9	94.5	6.1	0.019
ECP	37.8	29.7	37.0	56.7	27.8	<0.001
Injectables	43.5	41.4	44.9	64.8	22.0	<0.001
OCP	46.4	60.7	49.2	83.3	19.8	<0.001
IUD	33.8	45.3	32.7	66.2	22.1	<0.001

Key outcome indicators	Control (%)		Intervention (%)		Net Effect (%)	p value
	Baseline	Follow-up	Baseline	Follow-up		
SDM	13.7	11.1	14.0	30.2	18.9	<0.001
Girls aware about the practice/ use of Oral contraception pills	10.1	20.8	7.7	34.7	16.3	<0.001
Girls aware about the practice/ use of Emergency contraception pills	3.2	22.9	3.4	32.1	9.0	0.007
Girls aware about the practice/ use of condom	15.6	21.8	14.7	32.2	11.3	<0.001
Girls aware about the practice/ use of IUD/ Copper T	1.0	10.6	0.9	15.7	5.2	0.024
Girls aware about the practice/ use of injectables	1.5	12.1	2.6	17.6	4.3	0.072
Girls who bought contraception products online	4.0	0.6	4.4	1.6	0.6	0.584
Girls opinionated that girls should be responsible for deciding to use contraception	8.7	13.3	8.6	10.8	-2.4	0.231
Girls opinionated that girls should decide which contraception to use.	8.6	12.5	7.0	9.6	-1.3	0.49
Girls opinionated that 'both partners' should procure the contraception.	66.9	59.4	65.4	66.6	8.8	0.005
Girls know that condoms can prevent STDs	20.1	25.8	20.2	40.2	14.3	<0.001
Girls will talk and convince their partners if they don't want to use any contraception (in the future when they will have a sexual relationship)	21.8	43.2	20.5	48.2	6.3	0.035

Annex 5X: ITT approach: Key outcome results assessing the effect of GNG game using Generalized Estimating Equations (GEE) analysis

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Girls who received information or services from health providers	Didn't received	1.34 (1.03-1.73)	0.027
Girls will talk to a health service provider if they come across women health-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	1.46 (1.06-2.01)	0.021
Girls will talk to a health service provide if they face any menstruation-related problems in the next 6 months	Talk to friends/family, search online, or don't do anything	1.94 (1.39-2.71)	<0.001
Girls will talk to a health service provider if they come across any doubts about menstruation-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	1.56 (1.11-2.20)	0.01
Awareness about number of menstrual hygiene products			
Awareness of locally prepared napkins	No	2.27 (1.70-3.03)	<0.001
Awareness of sanitary napkins	No	1.41 (0.66-3.00)	0.374
Awareness of tampons	No	10.24 (7.67-13.69)	<0.001
Awareness of menstrual cup	No	8.74 (6.65-11.48)	<0.001
Awareness of reusable pads	No	7.59 (5.74-10.02)	<0.001
Awareness about number of menstrual hygiene products[1]			
Awareness of locally prepared napkins[1]	No	2.23 (1.67-2.99)	<0.001
Awareness of sanitary napkins[1]	No	1.39 (0.65-2.95)	0.398
Awareness of tampons[1]	No	10.28 (7.68-13.77)	<0.001
Awareness of menstrual cup[1]	No	8.72 (6.63-11.48)	<0.001
Awareness of reusable pads[1]	No	7.54 (5.71-9.97)	<0.001

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Girls using menstrual hygiene products	Non-hygienic (cloth)	1.36 (0.97-1.91)	0.079
Girls using menstrual hygiene products[2]	Non-hygienic (cloth)	1.38 (0.98-1.94)	0.064
Girls track /keep record of their menstrual periods	No	1.40 (1.04-1.88)	0.026
Girls track their menstrual period through mobile application	No	1.42 (0.59-3.39)	0.431
Girls track their menstrual period through mobile application[3]	No	1.45 (0.60-3.50)	0.412
Girls disagreed (strongly disagree/disagree) that 'period blood is dirty'	Strongly agree/agree/neutral	1.76 (1.30-2.40)	<0.001
Girls agreed (strongly agree/agree) that "girls should not be embarrassed to tell someone if they have their periods"	Strongly disagree/ disagree/ neutral	0.70 (0.54-0.93)	0.012
Girls know about fertility awareness (Halfway between two periods)	Don't aware	1.81 (1.02-3.20)	0.043
Girls know about fertility awareness (Halfway between two periods)[4]	Don't aware	1.78 (1.01-3.16)	0.047
Girls who ever troubled to obtain menstrual hygiene products	No	1.38 (1.01-1.89)	0.045
Girls who bought sanitary napkins online	No	3.12 (1.95-4.99)	<0.001
Girls confident to access menstrual product online	Not confident	1.99 (1.37-2.89)	<0.001
Girls confident to discuss about menstrual health with others	Not confident	2.63 (1.77-3.91)	<0.001
Girls using cloth in menstruation	No	0.74 (0.52-1.04)	0.079
Girls using cloth in menstruation[2]	No	0.72 (0.51-1.02)	0.064
Girls who know what they want to pursue as career	Unsure	0.72 (0.51-1.02)	0.064
Girls who are doing anything to pursue their career	No	1.14 (0.87-1.49)	0.349
Girls who are aware about CV	No	1.90 (1.48-2.45)	<0.001
Girls who are aware about CV[5]	No	1.91 (1.48-2.46)	<0.001

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Girls who are aware about internship	No	2.77 (2.09-3.69)	<0.001
Girls who are aware about internship[5]	No	2.78 (2.09-3.69)	<0.001
Girls aware about legal age of marriage for girls (18)	Don't know	1.04 (0.84-1.30)	0.718
Girls aware about legal age of marriage for girls (18)[6]	Don't know	1.04 (0.83-1.30)	0.718
Girls aware about legal age of marriage for boys (21)	Don't know	1.27 (0.95-1.71)	0.109
Girls aware about legal age of marriage for boys (21) [6]	Don't know	1.27 (0.95-1.71)	0.109
Girls who believed 'girls should make decisions for themselves'	Disagree/can't say	1.84 (1.25-2.71)	0.002
Girls who believed that 'girls should manage their own money'	No	3.26 (1.87-5.69)	<0.001
Girls will talk to their parents if their parents did not like what you are wearing	Other responses (change cloth immediately or wear extra cloth until out)	1.77 (1.37-2.29)	<0.001
Girls who believed 'girls can choose when to marry'	Disagree/can't say	2.16 (1.58-2.94)	<0.001
Girls who believed 'girls should be financially independent'	Disagree/can't say	2.44 (1.64-3.62)	<0.001
Girls who disagreed that 'girls can work only if their husband allows'	Agree/can't say	1.23 (0.97-1.56)	0.095
Girls who believe that they should select their marriage partners	Other should select	1.34 (1.06-1.70)	0.014
Girls who believe that they can talk to their parents when they were asked to marry a person whom they do not want to marry	No	1.69 (1.29-2.23)	<0.001
Girls who bought products online			
Clothes	No	1.18 (0.95-1.47)	0.138
Makeup (cosmetics)	No	1.54 (1.20-1.96)	0.001
Health products	No	2.17 (1.41-3.32)	<0.001

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Hair products	No	1.32 (0.91-1.89)	0.14
Pain relievers medicines	No	3.75 (1.67-8.42)	0.001
Medicine	No	1.68 (0.82-3.47)	0.158
Girls ever sought information from frontline workers	No	1.24 (0.94-1.64)	0.135
Girls ever sought health advice online	No	1.23 (0.86-1.74)	0.257
Girls who perceive teasing, catcalling, stalking etc. is not at all right			
Friend	Alright	0.84 (0.51-1.39)	0.496
Boyfriend	Alright	1.02 (0.55-1.87)	0.96
Other known people	Alright	0.81 (0.35-1.88)	0.617
Unknown People	Alright	0.83 (0.27-2.58)	0.752
Girls confident to say no to a sexual act to their boyfriend	Not confident	2.46 (1.67-3.62)	<0.001
Girls confident to say no to a sexual act if not willing to do to their boyfriend	Not confident	2.80 (1.85-4.23)	<0.001
Girls confident to use condom when her boyfriend is not willing to	Not confident	1.74 (1.22-2.49)	0.002
Girls think they can change their minds anytime about touching if they don't want it.	Don't agree/can't say	1.78 (1.27-2.48)	0.001
Girls think they can change their minds anytime about kissing if they don't want it.	Don't agree/can't say	1.51 (1.11-2.05)	0.008
Girls think they can change their minds anytime about sex if they don't want it.	Don't agree/can't say	1.74 (1.28-2.36)	<0.001
Girls think their boyfriend should always take consent for touching.	Not always (only first time, never, depends)	1.47 (1.13-1.90)	0.004

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Girls think their boyfriend should always consent to kissing.	Not always (only first time, never, depends)	1.51 (1.17-1.96)	0.002
Girls think their boyfriend should always consent to sex.	Not always (only first time, never, depends)	1.58 (1.22-2.05)	0.001
Girls aware about the legal age of consensual sex	Don't know	2.14 (1.66-2.76)	<0.001
Girls aware about POCSO act	Don't know	3.20 (2.28-4.48)	<0.001
Girls think that after having sex with a partner one time, they can refuse to have sex with him the next time. (Ability to refuse sex)	No/ don't know	1.99 (1.53-2.58)	<0.001
Girls aware about women helpline number	No	2.80 (2.11-3.71)	<0.001
Girls aware about cell for reporting violence related incidents	No	3.03 (2.30-3.99)	<0.001
Girls will talk to a health service provider if they come across any contraception-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	1.62 (1.17-2.23)	0.003
Girls will talk to a health service provider if they come across any doubts about contraception-related issues in next 6 months	Talk to friends/family, search online, or don't do anything	1.76 (1.26-2.44)	0.001
Girls aware about different contraceptive methods (spontaneous)			
Condom	No	1.54 (1.17-2.03)	0.002
ECP	No	2.30 (1.55-3.39)	<0.001
Injectables	No	2.63 (1.93-3.59)	<0.001
OCP	No	2.13 (1.60-2.84)	<0.001
IUD	No	2.73 (1.97-3.77)	<0.001
SDM	No		0.001
Girls aware about different contraceptive methods (prompted)			

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
Condom	No	2.10 (1.51-2.90)	<0.001
ECP	No	3.32 (2.52-4.36)	<0.001
Injectables	No	2.39 (1.87-3.07)	<0.001
OCP	No	2.73 (2.07-3.60)	<0.001
IUD	No	2.41 (1.87-3.10)	<0.001
SDM	No	3.47 (2.43-4.96)	<0.001
Girls aware about different contraceptive methods (prompted+ spontaneous)			
Condom	No	2.28 (1.57-3.31)	<0.001
ECP	No	3.25 (2.49-4.23)	<0.001
Injectables	No	2.49 (1.95-3.18)	<0.001
OCP	No	2.91 (2.20-3.85)	<0.001
IUD	No	2.52 (1.95-3.25)	<0.001
SDM	No	3.42 (2.40-4.88)	<0.001
Girls aware about different contraceptive methods (spontaneous + prompted)			
Condom[7]	No	2.28 (1.57-3.31)	<0.001
ECP[77]	No	3.27 (2.50-4.26)	<0.001
Injectables[7]	No	2.49 (1.95-3.18)	<0.001
OCP[7]	No	2.91 (2.20-3.84)	<0.001

Key outcome indicators	Reference value	Adjusted odd ratio (95% CI)	p-value
IUD[7]	No	2.51 (1.95-3.24)	<0.001
SDM[7]	No	3.43 (2.41-4.89)	<0.001
Girls aware about the practice/ use of Oral contraception pills	No	2.70 (1.67-4.36)	<0.001
Girls aware about the practice/ use of Emergency contraception pills	No	1.39 (0.63-3.07)	0.411
Girls aware about the practice/ use of condom	No	1.84 (1.27-2.66)	0.001
Girls aware about the practice/ use of IUD/ Copper T	No	1.88 (0.47-7.53)	0.374
Girls aware about the practice/ use of injectables	No	0.79 (0.30-2.13)	0.648
Girls who bought contraception products online	No	2.33 (0.82-6.59)	0.11
Girls opined that girls should be responsible for deciding to use contraception	Others (boy/ both)	0.80 (0.52-1.22)	0.304
Girls opined that girls should decide which contraception to use.	Others (boy/ both)	0.93 (0.60-1.45)	0.744
Girls opined that 'both partners' should procure the contraception.	Boy or girl independently	1.46 (1.12-1.91)	0.005
Girls know that condoms can prevent STDs	No	1.95 (1.46-2.60)	<0.001
Girls know that condoms can prevent STDs[8]	No	1.94 (1.45-2.59)	<0.001
Girls will talk and convince their partners if they don't want to use any contraception (in the future when they will have a sexual relationship)	Do not convince (accept/ reject/ postponed)	1.32 (0.99-1.77)	0.06