Online Safety with SnehAI

Evaluation of the project, 'SnehAI': Report

Submitted to: Population Foundation of India

Content

List of Abbreviations

OCSEA	Online Child Sexual Abuse and Exploitation
IMAI	Internet and Mobile Association of India
NCRB	National Crime Record Bureau
IPV	Intimate Partner Violence
PSM	Propensity Score Matching
IDIs	In-depth interviews
KIIs	Key-informant interviews
SRH	Sexual and reproductive health
FE	Fixed effects
UP	Uttar Pradesh
POCSO	Protection of Children from Sexual Offence
IPC	Indian Penal Court
IRB	Institutional Review Board
NCRB	National Crime Record Bureau
CPWW	Cyber Crime Against Women and Children
NGO	Non-Government Organization
IT	Information Technology
BCG	Boston Consulting Group
EVAC	End Violence Against Children
SBCC	Social Behaviour Change Communication programme
MKBKSH	Main Kuch Bhi Kar Sakti Hoon
NLP	Natural Language Processing

Executive Summary

In recent years, India has witnessed significant growth in Internet access, with over 50% of the populace having access, according to a joint Internet and Mobile Association of India (IAMAI) and KANTAR report (2022). Despite the benefits of the internet, such as improving access and reaching the last mile, its proliferation poses challenges such as electronic duality, information asymmetry and fragmented personal self, among others. Adolescents, constituting 5% of Indian Facebook users, are vulnerable to online abuse. Interpol reported 2.4 million instances of online child sexual abuse and exploitation (OCSEA) in India from 2017 to 2020. In response to the growing cases of OCSEA, the Population Foundation of India created SnehAI, an Artificial Intelligence (AI)-driven chatbot on Facebook Messenger and WhatsApp. SnehAI engages adolescents on internet safety, sexual health, and reproductive health (SRH) through stories, quizzes, and videos, aiming to boost their digital resilience.

Given the context, the primary objective of this evaluation was to assess SnehAI on the reach, engagement, knowledge, and awareness change it has enabled among adolescents. Detailed objectives were to: 1) Measure the difference in knowledge, attitudes, and behavioural intentions on OCSEA between users and non-users of SnehAI. 2) Assess the reach and engagement of SnehAI users with the OCSEA and digital safety content. 3) Understand user experience and feedback on using the SnehAI chatbot.

Given the objectives, a quasi-experimental single difference, mixed-method approach was adopted for the evaluation, comprising two data sets: primary and secondary. Secondary data included a literature review and the analysis of platform data. Meanwhile, primary data included quantitative online surveys and qualitative interactions with the Population Foundation of India program team.

- The literature review focused on three themes, namely, internet access in India, qualities of the internet that make it susceptible to adolescents, and the prevalence of OCSEA.
- Analysis of platform data was done using two different datasets. One was conversation-level data available from July 2022 to October 2023. The second was message-level data available from May 2023 to October 2023. For both datasets, Facebook and WhatsApp data were analysed.
- Quantitative data collected through an online survey, ***including 152 adolescents in the comparison group and 876 in the intervention group***, was analysed using logit regression. Four models of logit regression were carried out, with the fourth being the most robust, which was used for analysis. The logistic regression was conducted for critical variables, including the assessment of risk to privacy and security, awareness of laws/rules to prevent OCSEA, awareness of platforms/helplines to report OCSEA, and two situational questions to compare the differences between users and non-users. For the remaining variables, a descriptive statistical analysis was done.
- Qualitative interactions with the Population Foundation of India project team members were analysed using Excel. Findings from qualitative interactions were used in recommendations and suggestions.

The key findings emerging from the study are as follows.

Secondary Analysis
- SnehAI demonstrated significant reach, with over 1.5 lakh users visiting SnehAI between July 2022 and October 2023
- SnehAI experienced exponential yearly growth (120%) and saw increased reach during specific months, possibly linked to intensified promotional activities.
- Repeat usage patterns varied between platforms, with WhatsApp (40%) outperforming Facebook (24%) in terms of the number of users revisiting the chatbot
- Almost 2 lakh conversations occurred on SnehAI within 16 months from July 2022 to October 2023

- SnehAI showcased peak viewership from 2 PM to 4 PM IST, likely corresponding to the time when school-going children use social media.
- In terms of engagement, SnehAI facilitated 13 lakh messages in 2 lakh unique conversations, with higher engagement observed on WhatsApp (10 messages/user) compared to Facebook (8 messages/user).
- The cumulative time spent on the chatbot was 4,63,721 minutes, averaging 2.34 minutes per user.
- Attrition rates were notable, with a substantial percentage of users leaving the chatbot without viewing content beyond the introduction. On Facebook, only 1.9% of users who initially opted for OCSEA content proceeded to the first step of a story, and on WhatsApp, the figure was 12%. Continuous attrition occurred across various interactive modules, highlighting scope for improvement in user engagement.

Primary Data

Internet Access and Usage

- Access to the internet was universal, with a slightly higher proportion of adolescents in the intervention group (99%) having access compared to the comparison group (97%)
- The majority of adolescents spent more than 30 minutes on the internet daily. Only 6% of adolescents in the comparison group and 9% in the intervention group spent less than 30 minutes on the internet
- WhatsApp was the most widely used platform for both the comparison (80%) and intervention groups (84%)
- In addition to WhatsApp, YouTube, and Instagram were also popular among adolescents in both the comparison and intervention groups
- A comparatively smaller proportion of adolescents used Facebook, with only 62% in the comparison group and 53% in the intervention group

Knowledge, Awareness, and perception of users and non-users

- Adolescents from the intervention group demonstrated a better understanding of the risks associated with internet and social media use for privacy and safety. 41% in the intervention group assessed as high risk compared to 21% in the comparison group.
- Compared to the comparison group, more adolescents from the intervention group identified various risks such as hacking, account takeovers, shared data location, data mining, false information, malware, and OCSEA. Conversely, the comparison group exhibited better awareness of risks related to clicking on malicious links, cyberstalking, cyberbullying, fake online relationships, and impersonation
- Although the intervention group showed awareness of the general risks of internet use, they were less likely to recognise the risk of sharing personal information on certain platforms (such as social media platforms like Facebook, dating sites, chatrooms, and games)
- Adolescents in the intervention group (74% in intervention, 62% in comparison) showed a better awareness of the laws and rules aimed at preventing OCSEA in India. However, despite being aware of the existence of these laws and rules, they were less likely to mention specific names associated with them
- Regarding awareness of platforms and helplines for reporting OCSEA, adolescents in the intervention group (62%) demonstrated a higher level of awareness in contrast to the comparison group (43%)
- In terms of names of platforms and helplines, a greater number of adolescents in the intervention group, as contrasted to the comparison group, were familiar with the government online crime reporting portal and Non-Government Organization (NGO) complaint cells. Conversely, adolescents in the comparison group were better aware of reporting options such as the police station, cyber

cell, Cybercrime Prevention against Women and Children (CCPW), and Protection of Children from Sexual Offences Act (POCSO) e-box.

- In situational questions involving photos of private parts, 67% of the comparison group and 56% of the intervention group chose to report the post to the platform
- In the situation of threat messages, 67% in the comparison group and 58% in the intervention group opted to report and block the person sending a message
- Both groups had multiple sources of information on OCSEA, including the internet, school teachers, parents, and siblings, with SnehAI being the source of information for more than 50% adolescents in the intervention group.

User feedback:

- Over 80% mentioned interacting with the chatbot more than once
- Stories were the most favoured content type, chosen by 76% of users
- A significant majority (88%) found SnehAI easy to use, with only 3% reporting it as very difficult
- An impressive 87% found information learned from SnehAI easy to apply in real-life situations
- Users expressed a high average confidence level (80 out of 100) in practising safe online behaviour after engaging with the chatbot

In light of the results and findings, the following **recommendations** have been suggested for the chatbot:

- Carry out a more rigorous longitudinal study to get deeper insights into user engagement
- Enhance focus and diversify content on WhatsApp to improve overall user engagement
- Introduce daily fact/question updates to stimulate user interest and knowledge. Utilise the notification feature to prompt revisits
- Redesign the flow of the chatbot to minimise the steps required for accessing games, videos, and stories in order to simplify the user's journey
- Introduce the feature of voice notes to reduce cognitive effort and further improve user satisfaction
- Improve overall retention by capturing user attention within the first 1-2 minutes, given that, on average, users spend only 2 to 3 minutes on the chatbot
- Provide an opportunity for personalisation to further enhance the experience of users on the chatbot.

Section 1: Background and Context

The primary objective of this evaluation was to assess the Population Foundation of India's artificial intelligence-powered chatbot named "SnehAI" on the reach, engagement, and knowledge and awareness change it has enabled among adolescents (18-19 years). This chatbot was specifically designed to offer verified information to adolescents on topics such as online safety and digital abuse in a secure and anonymous manner. The first section of this report delves into background information and context, explaining the necessity for a chatbot in the contemporary landscape and detailing the specific purposes it serves.

India has witnessed significant progress in internet penetration in the last decade. According to a collaborative report by the Internet and Mobile Association of India (IAMAI) and KANTAR (2022), the active Internet user population in the country now exceeds 50% of its total populace, comprising approximately 75.9 crore individuals who engage with the Internet every month. Projections from this report suggest that this number is poised to grow to 90 crore users by 2025. While the proliferation of internet usage offers numerous advantages, notably improved accessibility, it concurrently introduces a host of challenges. Davidson and Gottschalk's study (2011) outlines 17 distinctive attributes of the internet that make it an attractive arena for online abusers. These attributes encompass facets such as fragmented personal communication (lack of personal communication), intermediary technological tools (tool for connection of independent parties), universality (ability to enlarge and shrink the world), network externalities (increase in potential victims with increase in access), distribution channels (usage of internet to send information), temporal moderation (ability to shrink and enlarge time), cost-effectiveness standards (cost effective tool), electronic duality (creation of a digital copy of a real person), manipulation of electronic duality (manipulation of digital copy as per purpose), information asymmetry(exploitation of potential knowledge gap between groomer and child), boundless virtual capacity (unlimited access resulting in no comparison over time spent online for grooming), temporal and spatial autonomy (easy access to information across both distance and time), cyberspace (creation of virtual communities that increase likelihood of grooming), and dynamic social networks (provision of social context to expand social network). The interplay of these attributes, exacerbated by the lack of comprehensive online legislative frameworks, contributes to the internet's susceptibility as a focal point for abusive and exploitative activities. This assertion is supported by data from the National Crime Record Bureau (NCRB), which reported a total of 52,497 instances of cybercrime in India in 2021.

While all internet users are susceptible to manipulation and abuse in the online realm, specific demographics, including women, LGBTQIA+ individuals, children, and adolescents, are disproportionately vulnerable due to their societal positioning. Adolescents, in particular, face heightened susceptibility to online abuse and exploitation for two primary reasons. Firstly, they constitute a substantial portion of online users. 5% of Facebook users in India fall within the 13-17 age bracket (Statista,2023). Secondly, adolescence is a pivotal phase marked by the emergence of sexual orientation a proclivity for expanded social interaction, and the cultivation of interpersonal relationships. This period is also characterised by experimentation and exploration.

While these developmental attributes are not novel, digital technology provides novel avenues for exploration, thereby amplifying adolescents' vulnerability to coercion and sexual exploitation. The online platform enlarges the opportunities for unscrupulous individuals to establish manipulative relationships with minors. Technological tools facilitate the identification of potential victims, and the absence of geographical constraints in the digital realm allows perpetrators to target a broad spectrum of potential victims globally (United Nations, 2021). This phenomenon extends beyond the corners of the dark web and is prevalent even within prominent social media platforms.

Interpol reports indicate an estimated 2.4 million instances of online child sexual abuse in India between 2017 and 2020, with 80% of these incidents involving girls under the age of 14. The Global Threat Assessment Report of 2021 revealed a 95% increase in internet searches related to child sexual abuse materials during the COVID-19 pandemic. The NCRB data also showed that the cybercrime against

children has increased by 32% from 2021 to 2022. Notably, a significant portion of explicit content pertains to children or teenagers, constituting approximately 35-38% of the total pornographic content uploaded online. Keywords such as "schoolgirls," "teens," and "desi girls" prominently feature in search queries (Press Trust of India, 2021). Moreover, instances of children producing their sexual material saw a 77% uptick between 2019 and 2020. (Kanan, 2020).

These statistics highlight the critical importance of effective preventive strategies aimed at empowering Indian adolescents with knowledge, attitudes, and behavioural competencies essential for safeguarding themselves in the digital sphere.

In response to this imperative, in collaboration with Fund to End Violence Against Children (EVAC), the Population Foundation of India has proactively contributed to creating a secure online environment for adolescents through technological means. The Population Foundation of India has developed SnehAI, an artificial intelligence-driven chatbot accessible via Facebook Messenger and WhatsApp. SnehAI offers a secure, tailored, and non-judgmental platform where young individuals can express concerns and gain insights on internet safety and sexual and reproductive health. The chatbot employs a blend of narratives, games, quizzes, and videos to stimulate discussions on Online Child Sexual Exploitation and Abuse (OCSEA) and digital safety. By engaging users in conversations addressing abuse, exploitation, consent, violence, and digital safety, the overarching goal of the SnehAI chatbot is to expand adolescents' knowledge repository, thereby enhancing their resilience within the digital realm.

In recent years, there has been a surge in the development of intelligent tools, such as chatbots, for educational purposes. However, there is a notable lack of research on and evaluation of these educational chatbots. The current evaluation gathered feedback from chatbot users and compared their experiences and knowledge with a group that had not used it. Therefore, the findings from this evaluation will serve two purposes. Firstly, it will provide suggestions to the Population Foundation of India on improving the chatbot. Secondly, it will contribute to the limited body of literature dedicated to evaluating chatbots, thereby setting a precedent for future evaluations.

This report provides details on the study objectives and methodology, as well as the findings from the secondary data and primary data collection with adolescents and the Population Foundation of India team members.

Section 2: Evaluation objectives and methodology

2.1 Objectives of the evaluation:

The primary aim was to evaluate SnehAI, a chatbot designed for adolescents, to gain a deeper understanding of adolescents' (18-19 years) knowledge, attitudes, and behavioural intentions related to OCSEA and digital safety among adolescents. Detailed objectives are outlined below:

Measure the difference in knowledge, attitudes, and behavioural intentions on OCSEA – between users and non-users of SnehAI

2.1.1	Identify areas of knowledge on OCSEA, showing the difference between users and non-users
2.1.2	Measure differences in knowledge on OCSEA based on demographic characteristics
2.1.3	Assess attitudes and perceptions on OCSEA and digital safety
2.1.4	Understand behavioural intention to protect oneself from online abuse

Assess the reach and engagement of users with the OCSEA and digital safety content on SnehAI

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2.1.5	Measure the number of adolescents who have accessed and engaged with the SnehAI chatbot
2.1.6	Analyse patterns of usage, engagement, and interaction with the chatbot
2.1.7	Explore differences in reach and engagement based on participant demographics
2.1.8	Asses the overall level of engagement of the chatbot

Understand user experience and feedback on using the SnehAI chatbot

2.1.9	Understand perceptions regarding user-friendliness and accessibility of the chatbot
2.1.10	Suggest recommendations to enhance the effectiveness and usability of the chatbot

2.2 Framework of the evaluation

Based on the objectives, the following framework was used to guide the evaluation. The framework is outlined in Figure 2.1.

Figure 2.1. Framework of the evaluation
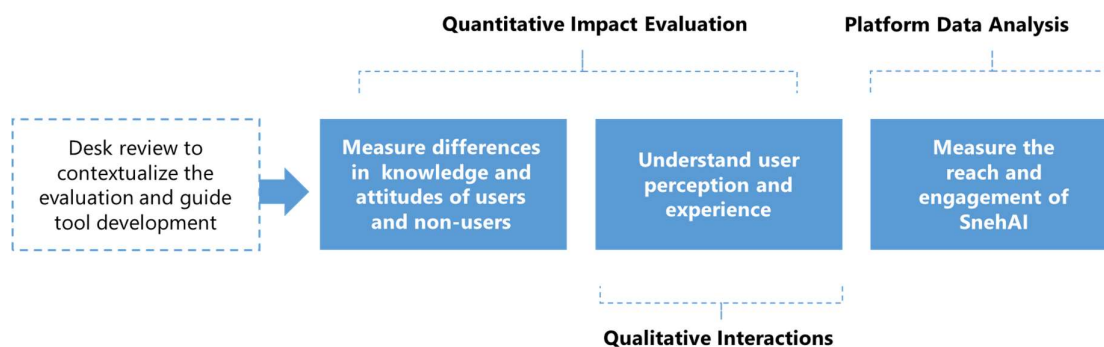
The above-mentioned framework aimed to assess the three key objectives using a mixed-method approach. Differences in knowledge and attitude of users and non-users were evaluated using a quantitative quasi-experimental single difference design. The user experience was understood through user surveys. Finally, the reach and engagement of the SnehAI chatbot were measured using the platform data. Ultimately, all this was tied together to understand the overall effectiveness of the chatbot.

2.3 Key areas of enquiry

Given the objectives and framework of the evaluation, the following areas of enquiry were studied. Areas of enquiry mapped to the objectives and methodology of the evaluation are provided below:

Objective	Areas of Inquiry	Methodology
Differences in Knowledge, Attitudes, and Behavioural Intentions		
Identify areas of knowledge showing the difference between users and non-users	• Awareness, and understanding of OCSEA • Perceptions about digital safety • Perception about advantages and disadvantages of social media usage • Perceptions on OCSEA – risks, its impact • Awareness of issues of online safety, responsible internet use, available platforms, existing laws, and regulations. • Sources of information related to OCSEA ○ Any access to training/information on online safety and responsible use of the internet – in schools or elsewhere • Awareness and access to tools/ platforms – online and offline	Quantitative Evaluation with Adolescents
Reach and engagement of users on SnehAI		
Number of adolescents who have accessed and engaged with the SnehAI chatbot	• No. of users who accessed Sneh AI • No. of users engaged on Sneh AI • No. of users dropped out after the first session • Average no. of bot breaks in a day	Platform data analysis
Analyse the usage pattern of interaction with the chatbot	• Index users into low, medium, and high users based on frequency and duration of usage • Analyse the engagement at different times of the day – morning, afternoon, and evening • Analyse engagement during weekdays and weekends (Saturday and Sunday)	
Assess the overall level of engagement with the chatbot	• No. of users who engaged with different modules • No. of low, medium, and high users who engaged with different modules • Average time spent by users on different modules	
Understanding supply and programmatic side factors related to the chatbot	• Perception regarding the relevance of the features of the chatbot • Underlying objectives of the content delivered through the bot • Experience with the implementation of the chatbot • Observed trends and patterns in preference for different kinds of modules • Reasons for the observed patterns in preferences • Recommendations to improve the effectiveness of the chatbot	Qualitative interaction with Population Foundation of India program team, chatbot (UI/UX) designers

2.4 Evaluation Approach

Given the objectives and areas of enquiry, the evaluation adopted a mixed-method approach. The mixed method approach comprised secondary and primary data analysis. The secondary data analysis included (i) desk review and (ii) analysis of platform data. The primary data consisted of (i) quantitative impact evaluation and (ii) qualitative interactions with program team members. Details of each of the four methods are provided below:

2.4.1 Secondary Data

Desk Review:

The analysis of existing secondary literature was centred on three aspects: the prevalence of Internet use among adolescents in India, characteristics of the internet that make it susceptible for adolescents, and the extent of OCSEA prevalence in India. This desk review fulfilled two purposes. Firstly, it enhanced the contextualisation of the study, with insights seamlessly integrated into this report's "background and context" section. Secondly, the desk review informed the development of tools for both quantitative surveys and qualitative interactions.

Indicators of Platform Data:

Raw data generated from the SnehAI chatbot (from both Facebook Messenger and WhatsApp) was analysed to understand usage patterns and interaction with chatbot content- including frequency and content-wise analysis, bot breaks, and analysis of the content viewed on the bot. The detailed indicators that were evaluated using the raw data are provided below:

Indicators	
1	**Indicators for Reach**
a.	Number of unique users on the SnehAI chatbot since its inception
2	**Frequency of Engagement**
b.	Number of unique users who engage with SnehAI over days/weeks/months to identify trends.
c.	Cumulative time spent by unique users on SnehAI (summed from all days on which users visited SnehAI)
d.	Cumulative number of days spent by unique users on SnehAI
e.	Days with highest/lowest engagement by unique users on SnehAI
f.	Average/Median duration of each conversation between unique users and SnehAI.
g.	Distribution of unique user engagement across different hours of the day to identify peak usage hours
h.	Distribution of unique user engagement across different days of the week to identify peak usage days
i.	Distribution of unique user engagement across weekends vs weekdays
j.	Time spent on online safety content by unique users
k.	Frequency of engagement with online safety content by unique users.
3	**Content Engagement**
l.	Percentage of unique users who access information on Online Safety, and About SnehAI on chatbot
m.	Percentage of unique users who interact do not complete interaction with specific content.
n.	Analyse viewership of Online Safety, SRH, and About SnehAI by unique users
o.	Analyse common pathways used to visit online safety content by unique users
p.	Analyse common last steps made by unique users when viewing online safety content
q.	Measure engagement with interactive elements of SnehAI
r.	Measures the number of unique users who engage with different modules (puzzle, stories, videos, and others)

Analysis of Platform Data:

The secondary analysis was conducted using two different data sets from the SnehAI platform: (i) conversation-level data and (ii) message-level data. The message-level data was obtained from the chatbot analytics, while the conversation-level data was retrieved from the platform backend. Message-level data was available from May 2023 to October 2023, whereas conversation-level data were available from July 2022 to October 2023. The major difference between the two data sets is that conversation-level data does not include details on modules used and content viewed, whereas message-level data contains these details. Conversation level data included time stamp, user ID, conversation ID, and number of user messages. On the other hand, message level data comprised of time stamp, user ID, conversation ID, message ID, number of user messages, last step (nodes), and skill (modules).

Once the data was received, it was cleaned and analysed using Excel and Stata-19. The indicators on which the data were analysed have been detailed in the previous paragraph. Given the nature of the data, there were certain limitations with the analysis, which are discussed below.

Limitation with Platform Data Analysis

There were four major limitations with the dataset, as highlighted below.
- The secondary analysis was conducted using **two distinct datasets**, as the agency that developed the chatbot, did not have access to message-level data for last year (2022). They were only able to retrieve conversation-level data from the backend. Hence, conversation-level data was utilised to analyse the reach of the chatbot, while message-level data was employed to analyse content engagement.
- In the case of the last steps [1] in the message-level WhatsApp data, there were **over 1000 nodes, as WhatsApp** employs various permutations and combinations of options to respond to user queries. This constraint limited in-depth analysis of the last steps in WhatsApp.
- **The conversation-level WhatsApp data was possibly incomplete**. According to the conversation-level data, there were 7,200 unique users on WhatsApp from January 2023 to October 2023. However, the message-level analysis, which covers a smaller timeframe, indicates over 32,000 unique users.
- The data was structured in a way that **unique users can only be calculated for a particular time frame**. For example, in monthly insights, the data shows users who were unique to that month rather than users who are unique to the chatbot for the first time in that month. Due to this reason, the total number (N) is different in conversation-level insights.

2.4.2 Primary Data

Quantitative impact evaluation:

To assess the differences in knowledge, attitude, and behavioural intentions between users and non-users, a quasi-experimental single difference design was adopted. As part of this design, an online survey with users of the SnehAI chatbot and with a comparison group of adolescents from similar age groups and geographies was done. Logit regressions were conducted to contrast the knowledge and attitude of SnehAI chatbot users with a comparison group consisting of non-users on the basis of their likeliness to make a particular choice. Adolescents in both the comparison and the intervention groups were older adolescents aged 18-19 years[2]. A summary of the quantitative evaluation design is mentioned in figure 2.2 below.

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[1] It refers to the last piece of content or module that the user interacted with at a specific time.
[2] Due to ethical considerations from the IRB regarding parental consent of minors, individuals below the age of 18 were not included in the study

*Figure 2.2 Summary of the quantitative survey design*

	Objectives	Survey Recruitment	Target Group	Analysis
Intervention Group	Measure the difference in **knowledge, attitudes, and behavioral intentions** between users and non-users of SnehAI between the age group of 18-19 years	Survey Ads through the FB/WhatsApp chatbot to recruit SnehAI users exposed to SnehAI till October 2023. Incentives in the form of mobile recharge was provided upon completion of the survey. upon	Ads pushed to the universe of SnehAI users through the chatbot Minimum Sample: 393	Logit regression + Descriptive statistical analysis
Comparison Group		The survey was pushed through advertisements on Facebook, Google ads and Instagram. Incentives in the form of mobile recharge was provided upon completion of the survey.	Targeted ads towards adolescent aged between 18-19 years adolescents Minimum Sample: 393	Logit regression + Descriptive statistical analysis

2.4.2.1 Evaluation Sample

The sample size for the evaluation was calculated based on the existing evidence on the impact of an interactive chatbot on gender attitudes and intimate partner violence (IPV) (Fillipo et al.,2023). According to the available evidence, the effect size ranged from 0.10 SD to 0.20 SD. Given this evidence, the study was powered at 80% with an effect size of 0.20 SD. Based on power simulations, a minimum sample size of 393 adolescents for both the intervention and comparison groups was required. However, the final sample included 152 for the comparison group and 876 for the intervention group. The final sample was powered at 62.4 % [3]with an effect size of 0.20 SD. Additional details about how the analysis was adjusted to accommodate the smaller comparison sample is provided in subsequent paragraphs.

The power simulations used to calculate the required sample size are illustrated in Figure 2.3 below.

Figure 2.3 Power calculation to derive sample size for quantitative surveys

Power Simulations: Sample Size at 0.20 SD Effect Size
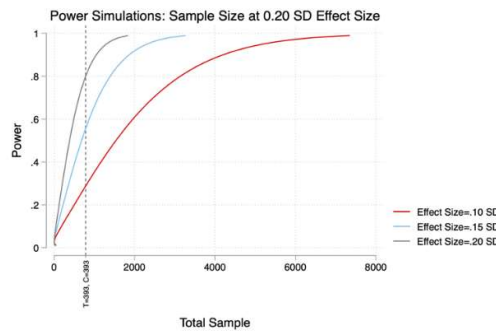
Sample selection strategy for the intervention group

The intervention group, comprising SnehAI users (adolescent girls and boys 18-19 years of age), was chosen through online recruitment. Recruitment of SnehAI chatbot users on both Facebook Messenger and WhatsApp was carried out through the chatbot itself. The online survey was disseminated on the

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[3] Considering the revised power calculation, there is a risk of a type 2 error in the analysis, which involves rejecting the alternative hypothesis even when it is true. In other words, there might be some program effects (changes in knowledge and awareness due to exposure to SnehAI), but the evaluation may not be able to detect them due to the limitations of the sample size.

chatbot by the Population Foundation of India, and users accessed it by clicking on a provided link. All participants were informed that they would receive compensation for their time and effort in the form of a mobile data recharge upon successful completion of the survey.

The chatbot allowed for targeted outreach to its users. **This feature was leveraged to ensure a high response rate, where the survey was pushed to a total of 2.1 lakh maximum chatbot users across Facebook and WhatsApp, who would have accessed the chatbot till 31st October 2023.**

<u>Sample selection strategy for the comparison group</u>

The comparison group was recruited online through advertisements on Facebook, Instagram, and Google ads. These advertisements encompassed details regarding the survey's objectives and compensation upon survey completion and incorporated keywords similar to those utilised by the Population Foundation of India in their Facebook and Instagram chatbot advertisements. The advertisements were promoted in predominantly Hindi-speaking states of India because the intervention group was also expected to be from these regions.[4] The advertisements contained links to the survey, which, when clicked, directed the user to an online platform for survey completion. Upon completion of the survey, adolescents were provided with mobile recharges on phone numbers they mentioned in the survey.

<u>Analysis of Quantitative Data:</u> The collected data was analysed in the following manner:

<u>Quantitative data</u>: The data gathered from both the intervention and comparison groups were subjected to analysis employing logistic regression. This analytical approach was useful in predicting the likelihood of an event happening or a choice being made. In this case, the independent variable was the (dichotomous) grouping variable: intervention vs. comparison. The dependent variables were the knowledge and awareness of OCSEA. The logistic regression yielded odds ratios and a statistical significance (P) value for each independent variable. This enabled an understanding of whether or not the independent variables were significantly associated with the likelihood of an event happening or a choice being made and, if they were, what the effect sizes were, as exemplified by the odds ratios.

For the logit regression analysis, four models were employed. Model 1 was a simple logit regression model with a single difference, where no variable was controlled or fixed. Model 2 controlled for internet usage. Model 3 controlled for both internet usage and gender. Model 4 was the most robust, as it controlled for internet usage, gender, and residence. Since Model 4 was the most robust, it provided the most accurate results, attributing the difference between the two groups solely to their exposure to SnehAI, as other compounding variables were controlled. In contrast, in other models, difference can also be attributed to compounding variables. Hence, model 4 has been used for the analysis.

The logistic regression was conducted for critical variables, including the assessment of risk to privacy and security, awareness of laws/rules to prevent OCSEA, awareness of platforms/helplines to report OCSEA, and two situational questions, to compare the differences between users and non-users. For the remaining variables, a simple descriptive statistical analysis was done.

<u>Simple Descriptive Analysis:</u> In conducting the descriptive statistical analysis, percentages, proportions, and ratios were used to compare the knowledge and awareness levels of chatbot users with those who did not use the chatbot.

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[4] The advertisements through which adolescents join the SnehAI chatbot are targeted at Hindi-speaking regions of India. Consequently, the majority of its users are from these same regions.

Initially, in order to match the comparison and the intervention groups, propensity score matching (PSM) was proposed. However, since we could not meet the required minimum sample for the comparison group, matching based on PSM was not possible. Further details on the reasons for not meeting the comparison sample requirement are provided under limitation subheading. For the same reason, sub-group analysis, which was also proposed as part of the quantitative analysis, was not possible.

Despite the inability to conduct propensity score matching, a comparison was made using a chi square-test between the comparison and intervention groups based on observable characteristics. For variables where the comparison and intervention groups differed significantly, those variables were controlled for during the regression analysis.

Qualitative Interactions:

Qualitative interactions were undertaken with the Population Foundation of India's program team. A list of final completed qualitative interactions is provided below.

Si. No.	Target Group	Qualitative Method	Completed Interactions
1	PFI program team	Key informant interviews (KII)	3

Analysis of Qualitative Data:

Qualitative data was collected through key informant interviews (KIIs) conducted with the Population Foundation of India program team, which has worked closely on the development and progress of the chatbot. The qualitative interaction yielded insights into the chatbot's journey, vision, and the challenges it has faced in the past. These insights were triangulated with primary and secondary data to suggest recommendations for the chatbot.

Ethical considerations with Primary Data Collection:

Given the sensitive nature of the evaluation, ethical considerations were taken into account during the primary data collection. The following considerations were made:

- Voluntary participation, based on informed written consent, was sought from adolescents. Adolescents were asked to read the evaluation information online and provide implicit consent by ticking a box.
- Upon completing the survey, adolescents were given a downloadable certificate containing information such as the organization's name, study name, purpose, and the Development Solutions office's landline number for queries. The certificate, bilingual and stamped by Development Solutions, served as acknowledgment.
- The bilingual consent form (Hindi and English) outlined the study's content, voluntary participation nature, and the right to refuse.
- The survey was conducted anonymously, with no personal identifiers such as name, address, or school name requested.
- Respondents' information was treated with privacy and confidentiality. The report will not mention individual cases; only a summary of data/information was analysed and presented.

These ethical considerations received approval from Development Solutions' internal Institutional Review Board (IRB). Surveys were rolled out only after obtaining IRB board approval (*dated 13th November, 2023 with IRB number 26/IRBDS/2023-2024*).

Limitations and Challenges with Primary Data:

Considering the dearth of research on the evaluation of chatbots and the absence of a clear precedent for online surveys targeting adolescents, this evaluation was conducted in an exploratory manner. In this context, the current evaluation encountered several limitations and challenges, all of which are comprehensively outlined below.

- Due to ethical concerns raised by the IRB regarding parental consent for adolescents participating in an online survey, the age group of the target adolescents was modified from 13 to 19 years to 18 to 19 years. This modification limited the reach of the survey.
- Regarding the online recruitment of the comparison group, the machine learning algorithm's training process took time. As the survey had to be closed within a stipulated period, the algorithm wasn't fully trained by the time the survey had to be closed. Consequently, this led to falling short of meeting the minimum sample requirement for the comparison group.
- Furthermore, for the online recruitment of the comparison group, the response completion rate was low. Out of the 1140 adolescents who initiated the survey, only 62 completed it. This may be attributed to the fact that the comparison group was promoted through Facebook/Instagram advertisements. In such cases, the reliability of the advertisement and the associated compensation is considerably lower compared to a survey pushed through a chatbot.
- Qualitative interactions with chatbot users were also proposed as part of the study. These interactions could not be completed as a high refusal rate was noted. Only 50% of the adolescents who expressed interest in qualitative interaction in the survey were open to receiving further information about the interaction. The remaining 50% either did not respond within the stipulated time or refused to continue the qualitative interaction after understanding its objectives and purpose. Overall, none of the adolescents continued with the interaction beyond the first five minutes.
- As the survey was online and there was no way to verify the age, adolescents could have lied about their age.
- Given that compensation was attached to the survey, there might be an incentive bias. Adolescents might have provided more favourable or positive responses in anticipation of compensation.
- For the analysis, since no baseline was conducted at the time of launch of the chatbot, a single difference design was used; instead of a difference in difference design.

To address the challenge of a small sample size for the comparison group, adolescents from the intervention group who indicated that they had not interacted with the SnehAI chatbot and mentioned Facebook and Instagram as the sources of awareness about the survey were retagged as the comparison group. This resulted in a total comparison group size of 152.

After all the cleaning and retagging, the final sample size for comparison was 152 and 876 for the intervention. Results and findings are discussed in light of these numbers.

The subsequent report is divided into three major sections: evolution of SnehAI, secondary analysis, and primary analysis. Section 3 captures the evolution of the chatbot, discussing its journey from conception to its current version. This section sets the context for readers, providing a foundation for a better understanding of the chatbot's results and findings. Section 4 covers the results and findings from secondary data, while Section 5 explores the results from primary data.

Evolution of SnehAI

Section 3: Evolution of SnehAI

3.1 SnehAI 1.O

SnehAI, an AI-powered chatbot, was introduced in April 2019, based on the learnings of the Population Foundation of India's transmedia Social Behaviour Change Communication programme (SBCC), *Main Kuch Bhi Kar Sakti Hoon* (MKBKSH, which translates as 'I, A Woman, Can Achieve Anything'). The avatar of the chatbot, 'Sneh', was based on the lead protagonist of the show (MKBKSH), Dr. Sneha. While creating the avatar, the core aim was to ensure that it came across as a confident, well-informed, inspiring, and approachable character- someone adolescents could relate to and reach out to for any advice.

> *"So, the idea was that people saw the bot as, say, a friend or an elder sister and not really like a mother or a teacher or some elder or counsellor. The idea was to keep it age-friendly within that range. So, young people see like a sister or a friend of their same age group."*
> ***Program team, Population Foundation of India***

Hosted on Population Foundation of India's Facebook page, the chatbot provided a secure, personalised, and non-judgmental space for adolescents to access verified information about issues related to their SRH, such as menstrual health, virginity, contraception, and conception. These themes were chosen based on issues that often concern young people and were developed in simple language. As SnehAI was envisioned for adolescents in Tier 2 and Tier 3 cities of Hindi-speaking regions, the bot was developed in HINGLISH. Internally referred to as SnehAI 1.0, the bot used a click-and-button approach at this stage. Interactive elements of content like stories, quizzes and videos were used to engage adolescents with the chatbot.

3.2 SnehAI 2.O

While the response to SnehAI 1.0 was promising and encouraging, the 'click and button approach' had certain limitations in directing the user to relevant content on the bot, which could potentially limit the engagement and reach of the chatbot in future. Hence, it was felt that there was a need to expand the reach of the chatbot and enhance user engagement.

In 2020, the focus was to reach a vast audience and make the bot more relatable. The chatbot was rebuilt as SnehAI 2.0, a text-based chatbot, where the focus was on increasing the bot's ability to understand user-typed messages and intent and respond back with relevant content. Hence, the Natural Language Processing (NLP) technique was embedded into the chatbot. The NLP allowed users to insert a text and get a response closest to their inquiry. For example, if the user typed 'cyberbullying,' content closest to cyberbullying was presented to the user.

As an increase in interactions with adolescents was anticipated, an explicit privacy policy and a feature to delete data on users' requests were added. Further, to increase the mass appeal of the avatar, its appearance was modified. The avatar was showcased wearing both Indian and Western clothes, and her hairstyle was changed from braided to open. At this stage, the chatbot also got its own Facebook page and was hosted as an independent entity rather than being hosted on the Population Foundation of India's Facebook page.

> *"So, all the content and everything that we created was like we wanted to enhance it from the first version in terms of how Sneha looked. She was not just wearing a suit anymore. She was in a top and a jeans and things like that so that it's a little more new age and it goes well with the adolescents"*
>
> ***Program Team Member, Population Foundation of India***

3.3: SnehAI 3.0

Thereafter, with the growing incidence of online abuse, particularly OCSEA, a need was felt to develop content that would help adolescents navigate the internet safely. Consequently, the Population Foundation of India collaborated with the End Violence Against Children (EVAC) fund, a global coalition focused on ending all forms of violence against children, with over 500 member organisations in 31 countries. The Population Foundation of India received a three-year grant from EVAC for the development of the chatbot on OCSEA.

As part of this new endeavour, the Population Foundation of India developed content on OCSEA for the SnehAI chatbot. A rigorous process was followed to create the chatbot's content.

- Initially, in addressing the broad topic of OCSEA, themes were identified based on research and interactions with adolescents to discern the most relevant issues they face online. This process resulted in the identification of 12–13 broad themes, with a final selection of 10 themes after discussions.
- Once the themes were identified, internal brainstorming was conducted to determine which theme would suit which interactive module format, such as videos, stories, and quizzes.
- A selection funnel was then followed to finalize the content. Multiple rounds of feedback were conducted to refine the content, ensuring coverage of all major themes. After this process, the content was finalized.
- Subsequently, the chatbot's user interface underwent internal pre-testing. Team members from the Population Foundation of India across different states were requested to go through the chatbot and review its user interface. They were asked to report any technical issues with the chatbot.

"So when we were ready with the chatbot, we did UI testing with our internal team members as well, where we requested 10 or 15 members of PFI in regions, in different states, as well as in Delhi office to go through the chatbot and tell us how they're feeling, what they like, what they don't like. And, you know, if there's any issue that they are facing and all of that."

Program Team Member, Population Foundation of India

After following the above-mentioned steps, SnehAI 3.0 was finally launched in 2021, which included themes such as online abuse, privacy, exploitation, digital safety, online grooming, and the significance of consent, in addition to content on SRH.

As SnehAI 3.0 became operational on Facebook Messenger, the Population Foundation of India team recognised the need to expand to WhatsApp, an application that gained popularity among adolescents during the pandemic for online classroom learning. To broaden its reach and enhance user engagement and experience, a WhatsApp bot was developed in 2022 as part of Meta's WhatsApp Incubator Program (WIP).

Once the chatbot was launched on WhatsApp, promotional activities were conducted through online campaigns on Meta and on-ground outreach with school children and other stakeholders, such as teachers, school staff, and counsellors. The on-ground campaigns also served as a source for feedback on the user-friendliness of the chatbot and the relevance of the content. The feedback received was used to diversify content; for example, content on 'online fraud' was added after receiving multiple queries from students during school visits.

Thus, the above discussion provides two key insights about SnehAI. Firstly, SnehAI has kept pace with the changing times. Since its inception to its current version, there have been many circumstantial changes, including the pandemic. The chatbot has evolved with these changes and tried to adapt to the current times. Secondly, the needs of users have been prioritised in the development process of SnehAI.

User feedback and requirements have consistently been used as parameters to make changes in the chatbot.

> *"I think the biggest achievement was that it did not stay where it was. It wasn't like itna bana dete hai (make only what is asked) and then stay there. We have built content, content for different mediums, we have created different type of content. We have engaged with parents, counsellors, teachers through offline outreach. It has constantly grown."*
>
> ***Program Team Member, Population Foundation of India***

An infographic depicting the evolution of SnehAI is provided below.

Figure 3.1: Infographic on evolution of SnehAI
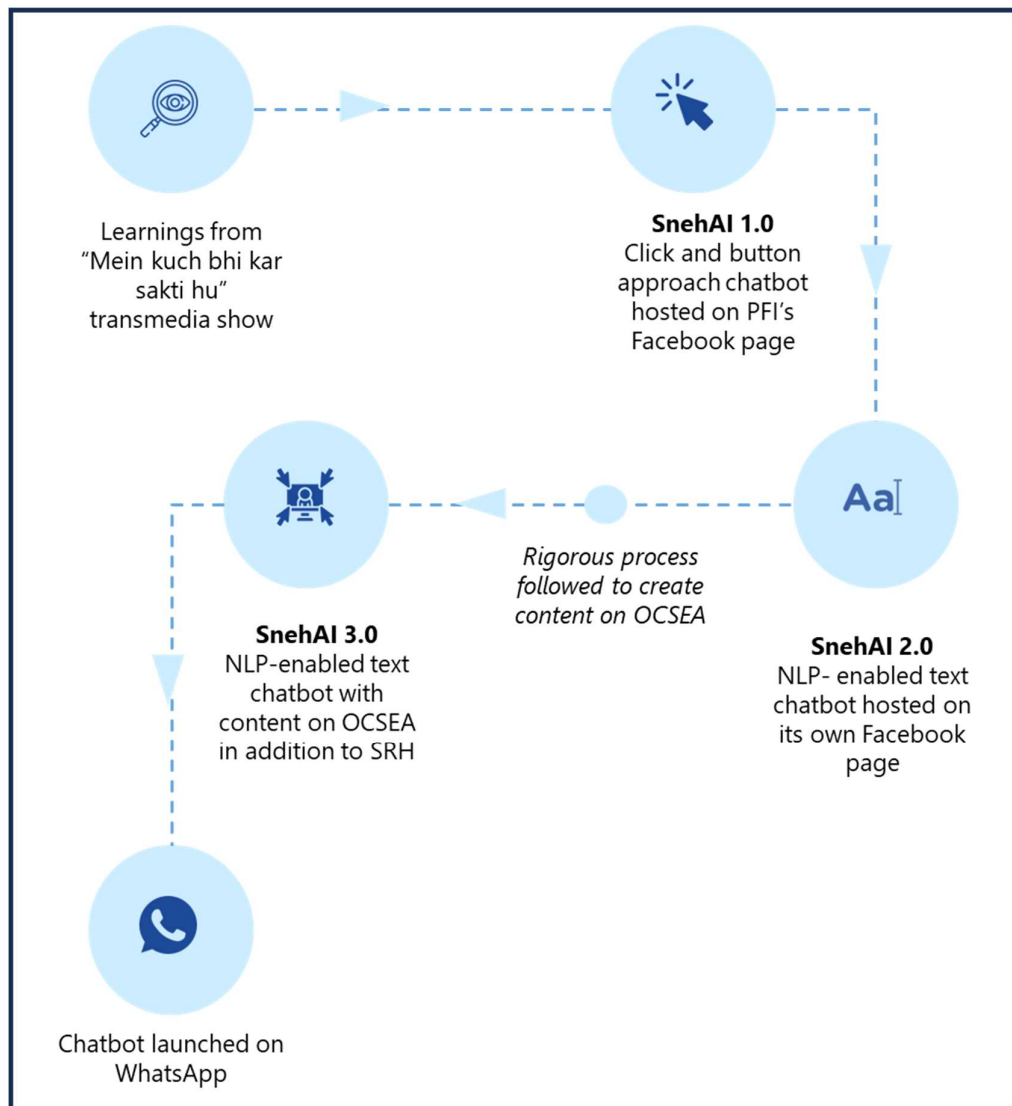
Results and Findings-Secondary Data

Section 4: Results and Findings from Secondary Analysis

Despite the limitations and challenges (as outlined in section 2), the secondary analysis provided a rich understanding of the reach and engagement of the chatbot, which is discussed in this section.

4.1 Reach of the chatbot:

The reach of the chatbot refers to the total number of users who have the ability to access and have accessed the chatbot or potentially interacted with it. The reach can be measured in terms of the number of unique users who visited the chatbot and the number of unique conversations done. The insights generated on the reach of the chatbot are mentioned below.

As per the conversation-level data, over 1.5 lakh users visited SnehAI between July 2022 and October 2023. Of these 1.5 lakh users, 67% (1,03,841) came from Facebook, and the remaining 33% came from WhatsApp (48,873). An infographic depicting the breakdown of unique users is presented below.

Figure 4.1: Unique users on SnehAI-Facebook and WhatsApp

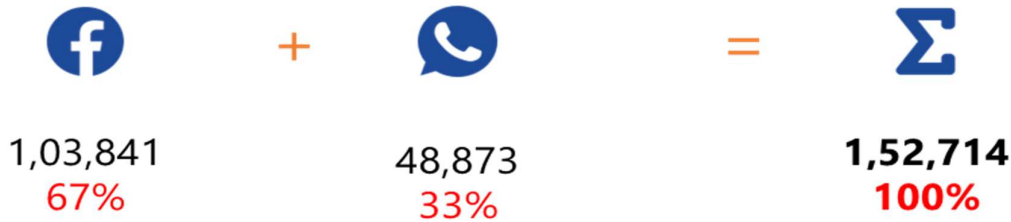1,03,841 67% + 48,873 33% = 1,52,714 100%

Of the users who visited the chatbot, 44,384 users came back to explore it again. In terms of repeat users, WhatsApp outperformed Facebook. The number of repeat users on Facebook were 24,846, making up to 24% of the total users who visited SnehAI-Facebook. On WhatsApp, the number of repeat users was 19,538, accounting for 40% of the users who visited SnehAI-WhatsApp.

The 1.5 lakh + users who visited SnehAI engaged in almost 2 lakh conversations. Between July 2022 and October 2023, a total of 1,97,098 unique conversations were done on SnehAI. Of these conversations, 1,28,687 (65%) were on Facebook, whereas 68,411 (35%) were on WhatsApp.

In terms of its reach, SnehAI has also demonstrated exponential yearly growth, with the number of users visiting the chatbot doubling (120% increase) from 2022 to 2023 as evident from graph 4.1 below.

Graph 4.1: Yearly growth of SnehAI

Yearly growth of SnehAI

46794 (2022) 105925 (2023)
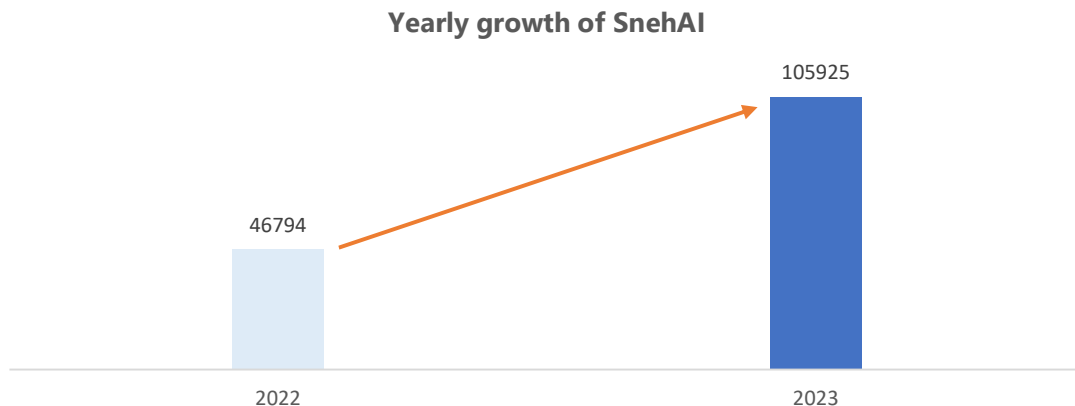
In addition to experiencing exponential yearly growth, the reach of SnehAI also peaked during specific months, as evident from graph 4.2 below. This increase in reach can potentially be attributed to intensified promotional activities. In months with increased promotional campaigns, both online and offline, SnehAI demonstrated noticeable growth in its reach.

Graph 4.2: Monthly breakdown of unique users on SnehAI (Facebook and WhatsApp)

Even within a month, there were specific weekdays when the viewership of SnehAI peaked, and this varied between Facebook and WhatsApp. On Facebook Messenger, Fridays and Saturdays performed better than all other days of the week (refer to graph 4.1 and 4.2, annexure1). In contrast, WhatsApp performed consistently across all days of the week, with Thursdays showing slightly higher engagement than other days. This might be because WhatsApp is more easily accessible on phones. Consequently, adolescents consistently use it throughout weekdays.

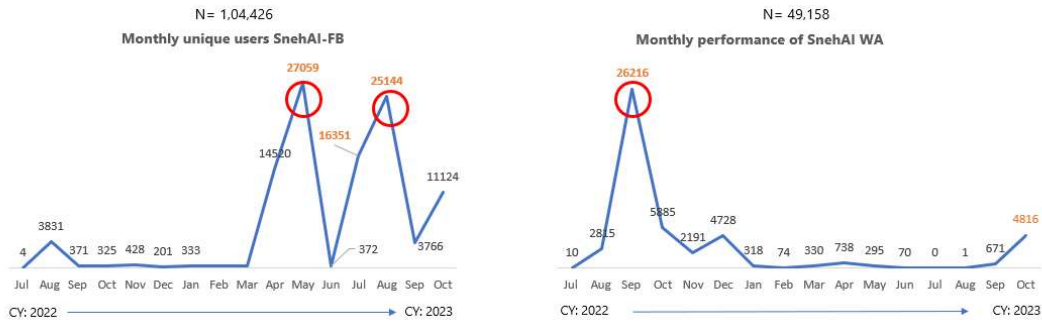In terms of time of the day, the viewership of SnehAI peaked from 2 PM (1400 hr) to 4 PM (1600 hr), IST. This trend is likely because this is the time when school-going children return home and engage with social media. The same pattern was found true for both Facebook and WhatsApp (refer to graph 4.3, annexure 1)

From the above insights, it can be concluded that SnehAI had an impressive reach among adolescents. This could potentially be attributed to multiple factors. Firstly, it might be a direct result of efforts undertaken to promote the chatbot through both offline and online mediums. Secondly, this could also be credited to the Population Foundation of India's previous work with adolescents, making their chatbot more easily credible and trusted among younger people. Lastly, this could be a direct result of positive feedback about the chatbot. If adolescents appreciate the chatbot in terms of its user-friendliness and content, they are more likely to recommend it to their friends, who then are likely to explore the chatbot, thus expanding its reach.

4.2 Engagement of users with the chatbot

Engagement with the chatbot refers to the level of interaction between users and the chatbot, which can include sending messages, viewing content, and other forms of interaction.

SnehAI is a text-based chatbot designed to interpret text and offer options or features based on user input. Consequently, each conversation on SnehAI is unique, following a distinct pathway. If a user does not insert text, there is a fixed chat flow that SnehAI follows which is outlined below.

SnehAI starts with an introduction where Dr. Sneha, the AI powered chatbot, introduces herself, mentions the confidentiality of data, and seeks the user's consent to begin the chat. After the introduction, SnehAI offers users the option between OCSEA (referred to as "Online Safety Jano" in the

chatbot) and sexual and reproductive health (SRH) (referred to as "Health and well-being" in the chatbot).

Regardless of OCSEA or SRH, the chatbot provides the option to choose among the interactive modules, which include stories, videos, games, and helplines. Clicking on any of these interactive modules opens up a choice of content within these modules. For example, under OCSEA, there are 5 stories, 2 games, 7 videos, and helplines. Once content is chosen, the chatbot takes the user to that content, usually broken into parts. This is the typical chat flow that the bot follows if the user doesn't enter text specifically requesting for a particular module/content type.

Given the design of the chatbot, engagement with SnehAI can be measured in terms of messages exchanged, time spent, modules and content viewed, and users retained till the end of the content, all of which are discussed in detail below.

Messages exchanged on SnehAI

According to the conversation-level data, of the 2 lakh unique conversations that occurred on SnehAI, 13 lakh messages were exchanged between the bot and the users (July'22 to October'23). More messages were exchanged on WhatsApp than on Facebook. The average number of messages per user on Facebook was 8, whereas on WhatsApp, it was 10. This could be indicative of greater engagement on WhatsApp compared to Facebook. Thus, while reach appears to be higher on Facebook, the engagement is greater on WhatsApp. This will be explored further through additional analysis presented as follows.

Time spent on SnehAI

Regarding the time users spent on the chatbot, a cumulative total of 4,63,721 minutes (322 days) was recorded. To determine the average time spent on the chatbot, this total duration was divided by the overall number of users, encompassing both unique and repeat users. The resulting calculation indicates that users, on average, spend 2.34 minutes on the chatbot (see figure 4.1).

Figure 4.1: Calculation of average time spent

$$\text{Average time} = \frac{\text{Total Time}}{\text{Total number of users}} \longrightarrow 2.3 \text{ min} = \frac{4,63,721 \text{ min}}{1,97,535}$$
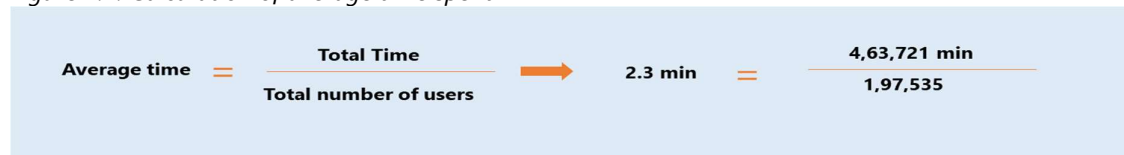
> Given the reduced attention span in current times, 2.34 minutes is a considerable duration. According to a report by Boston Consulting Group, social media users now have an attention span of 8 seconds, influenced by the popularity of short-form video services (Jalan et al, 2022). Thus, despite this shortened attention span, the chatbot succeeded in holding the users' attention beyond the typical duration.

Content viewed and retention of users till the end of the content

As discussed previously, a user on SnehAI can take multiple pathways depending on the text they insert. But regardless of the pathway, a user navigates between three modules which are introduction of SnehAI, OCSEA, and SRH. According to the message-level data, of the 1 lakh unique users who visited SnehAI in 5 months between July to October 2023, 36% of users (29,839) on Facebook and 21% (8,556) of users on WhatsApp opted for the OCSEA content. OCSEA content was more popular amongst the

adolescents as a smaller percentage opted for SRH. Even though more popular, a small proportion of users reached the point of choosing between OCSEA and SRH, more than half the users viewed the "SnehAI" introduction and left the chatbot.
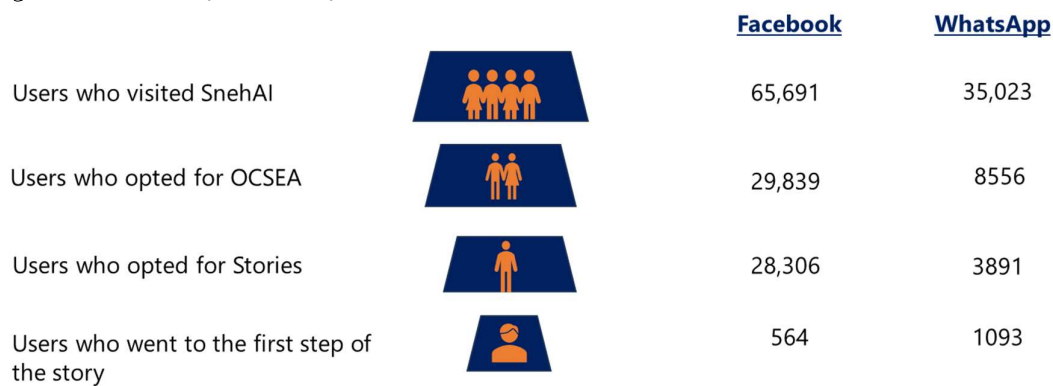
Of the 29,839 users who opted for OCSEA content on SnehAI- stories were most preferred on Facebook, 95% of them (28,306) accessed 'stories' as a preferred content type. Whereas videos were the most preferred on WhatsApp. 62% users (5318) accessed videos on WhatsApp.

On Facebook, among the 28,306 users who opted for stories, almost 98% exited without viewing any story. Therefore, overall, of the 28,306 users who initially opted for OCSEA content, 1.9% of them actually went to the first step of a story. This shows the continuous attrition of users at each step of the chatbot.

Similar to Facebook, WhatsApp also experienced continuous attrition, though the attrition rate was comparatively less than that with Facebook. On WhatsApp, of the 8,556 users, 45% (3,891) opted for stories. Of the 3,891 who opted for stories, 72% (2,798) exited stories without viewing any story. Therefore, overall, of the 8,556 users who initially opted for OCSEA content on WhatsApp, only 12% of them actually went to the first step of a story. A figure depicting funnel of attrition is provided below.

Figure 4.2: Funnel of attrition of users on SnehAI

		Facebook	WhatsApp
Users who visited SnehAI		65,691	35,023
Users who opted for OCSEA		29,839	8556
Users who opted for Stories		28,306	3891
Users who went to the first step of the story		564	1093

This was true not just for stories but for other interactive modules as well, such as games and videos, with less than 10% of the users opting for OCSEA content being able to reach the first step of these interactive modules (Figure 4.1 and 4.2, annexure 1).

In summary, the SnehAI chatbot effectively captures users' attention within their initial few minutes on the platform, with users spending an average of 2.34 minutes—surpassing the current average attention span (8 seconds as per research). Despite this success in initial engagement, a notable challenge lies in encouraging users to delve deeper into the OCSEA content. As the first-of-its-kind chatbot in India without a precedent to follow, SnehAI is continuously evolving through its own learning curve. The next significant task for the chatbot is to prompt users to engage with content.

Additionally, it's important to acknowledge that WhatsApp outperformed Facebook in terms of user engagement. Therefore, future efforts could benefit from a heightened focus on WhatsApp to enhance overall user engagement.

Key takeaways Section 4:

- SnehAI has experienced massive reach in a short span of 16 months (May 2022 to October 2023). As per the platform data, within 16 months, the chatbot managed to reach over 1.5 lakh unique users, which is an accomplishment in itself.
- In terms of reach, Facebook Messenger performs better than the chatbot. This could potentially be a matter of time as well, as SnehAI was initially launched on Facebook, and WhatsApp is a relatively newer version of the chatbot.
- While doing exceptionally well in terms of reach, the chatbot needs improvement in its engagement.
- In terms of engagement, WhatsApp performs comparatively better than Facebook. Hence, more focus can be directed towards WhatsApp in the next phase.
- Overall, two big challenges for the chatbot moving forward would be to get more repeat users and retain users until the last step of the content.

Results and Findings:
Primary Data

Section 5: Result and Findings from primary data:

This section of the report delves into the results and findings from the online quantitative survey. The section is divided into four parts. The first part, the respondent profile, sheds light on the demographic profile of adolescents from both the comparison and intervention groups. The second section explores internet access and usage, comparing the two groups based on the accessibility and usage of the internet. The third section focuses on the comparison of the intervention and comparison groups regarding knowledge and awareness of OCSEA. Finally, the fourth section provides insights into the user experience based on the usage of the chatbot.

5.1 Demographic Profile

A total of 876 adolescents in the intervention group and 152 adolescents in the comparison group were included in the analysis. Of these, 55% (84) of adolescents in the comparison group and 58% (509) adolescents in the intervention group were from urban areas (Table 5.1 in annexure 2).

In terms of states, adolescents were spread across the entire Hindi-speaking belt, with at least 1 respondent from each of the ten majority Hindi-speaking states. In both comparison and intervention groups, the maximum adolescents hailed from Uttar Pradesh (UP), 18% comparison (27 of 152) and 20% intervention (172 of 876), respectively. Apart from UP, a significant proportion of adolescents in both the comparison and intervention groups hailed from Rajasthan, Bihar, and Delhi. A detailed breakdown of the number of adolescents from each state is provided in Table 5.2 of the annexure 2.

Of the total adolescent adolescents, 85% in the intervention and 83% in the comparison group were male. Of the remaining, 15% in the intervention group and 16% in the comparison group were female. 2 adolescents from each of the groups identified themselves as transgender (table 5.3 in annexure 2).

In terms of family type, the majority of adolescents—52% in the comparison group and 56% in the intervention group—belonged to a nuclear family setup. 29% of the adolescents in each group lived in a joint family setup. Of the remaining, 17% in the comparison group and 14% in the intervention group were from a single-parent family setup. (Table 5.4 in annexure 2)

95% adolescents – 92% in the comparison and 97% in the intervention group were currently studying. Among those currently studying, 32% of adolescents (39% in comparison and 30% in intervention) were in the final years of their school (class 11th and 12th). 58% of the adolescents (54% in comparison and 58% in intervention) were pursuing their undergraduate studies (first year and second year of bachelors). The remaining adolescents were engaged in diploma and polytechnic courses. (Table 5.5 in annexure 2)

Among the 5% adolescents currently not studying, 19% last attended secondary school (class 9th and 10th) and 38% last attended higher secondary school (class 11th and 12th). A higher proportion of adolescents from the intervention (74% of 30) had completed their higher secondary school which is till class 12th, as compared to the comparison group (33% of 12) (Table 5.6 in Annexure 2).

In terms of the type of school attended, about one-third of adolescents in both groups were from government schools. 35% of adolescents in the comparison group attended government schools, while 31% in the intervention group were from government schools. After government schools, the highest proportion of adolescents were from private schools (30% in the comparison group and 27% in the intervention group). Additionally, 19% of adolescents from both groups attended private intermediate. Whereas 20% from intervention and 15% from comparison attended government intermediate schools (Table 5.7 in annexure)

<u>5.1.1Comparison of the two groups</u>

The two groups were assessed on the observable/ demographic characteristics, such as gender, current educational status, school type, residence type, family structure, and internet usage, to understand the level of similarity between them.

According to the chi-square test, the difference between the two groups was not found to be statistically significant for gender, residence, and family structure. The characteristics where there was a statistically significant difference between the two groups were status of current education, internet access, and school type. Table 5.8 in the annexure 2 captures the p-value of the two groups on the mentioned characteristics.

The demographic characteristics on which the difference between the two groups was statistically significant were controlled in the regression analysis [5]presented subsequently in this section.

Having understood the respondent demographic, the next section outlines adolescents' access to the internet and their use of the internet.

5.2 Internet Access and Usage:

Understanding internet access among adolescents is crucial for two reasons. Firstly, SnehAI is a chatbot that is accessible only when connected to the internet. Hence, only adolescents who have access to the internet will be able to access the SnehAI chatbot. Secondly, access to the internet determines the exposure to OCSEA among adolescents.

Of the total adolescents, 99% adolescents had access to the internet on a phone/ computer/ laptop, which they either owned or used. A marginally higher proportion of adolescents in the intervention group (99%) had access to the Internet as compared to the adolescents in the comparison group (97%) (as seen in graph 5.1).

Graph 5.1: Adolescents who had access to internet in comparison and intervention group (N for Intervention =876, N for comparison =152)

Access to Internet

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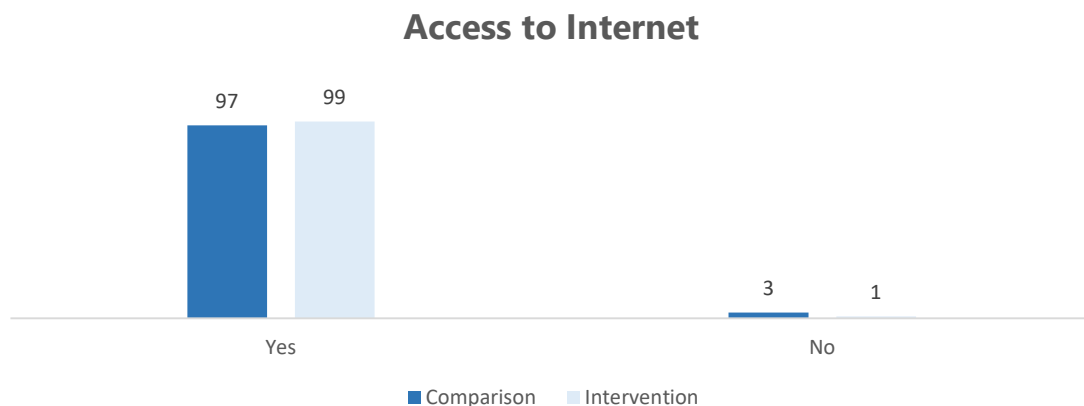
[5] In addition to statistically significant variables, gender was also controlled in the regression analysis. This step was taken because past research (Chaudhary et al., 2018) has demonstrated significant variations in the prevalence of child sexual abuse between genders. Consequently, the experience of using a chatbot for online child sexual abuse is likely to differ significantly by gender. Including gender in the analysis added rigor to the regression model.

Among those who had access to the internet, only 6% adolescents in the comparison group and 9% in the intervention group mentioned spending less than 30 minutes on the internet every day. Of the remaining, 20% of adolescents (16% in the comparison group and 21% in the intervention group) mentioned using the Internet for 1-2 hours daily. Another 23% of adolescents (20% in comparison and 24% in intervention) used the internet for 2-3 hours daily, while 30% (30% in comparison and 31% percent in intervention) used it for more than 3 hours). (Table 5.9 in annexure 2).

Therefore, it can be concluded that both the intervention and comparison groups had internet access, with slightly better access observed in the intervention group compared to the comparison group.

5.2.1Digital Platforms Used

In addition to understanding "how much" time adolescents spend on the internet, it is crucial to comprehend "where" they spend their time. When asked about the platforms they used on the internet, 80% in the comparison group and 84% in the intervention group mentioned WhatsApp. Following WhatsApp, Instagram (75% of 147) was the second most widely used platform for the comparison group, whereas YouTube (77% of 870) took the second spot for the intervention group. The third most widely used platform for the comparison group was YouTube (71% of 147), while for the intervention group, it was Instagram (74% of 870).

Another key point to highlight is that Facebook did not rank among the top three most widely used platforms for either the comparison or the intervention group. Only 62% of adolescents in the comparison group and 53% in the intervention group used Facebook. This indicates a trend where Facebook is not the most preferred platform for adolescents. WhatsApp, YouTube, and Instagram are used by more adolescents than Facebook (Table 5.1).

Table 5.1: Platforms used on internet by adolescents in intervention and comparison group

What all platforms do you use on the internet?				
	Comparison		Intervention	
	Frequency	% of cases	Frequency	% of cases
WhatsApp	117	80%	731	84%
Facebook	91	62%	462	53%
Instagram	110	75%	640	74%
Twitter/ X	41	28%	237	27%
YouTube	105	71%	668	77%
Tinder	15	10%	44	5%
OTT platforms	54	37%	293	34%
Snapchat	47	32%	331	38%
Snare chat	3	2%	70	8%
LinkedIn	27	18%	197	23%
Pinterest	15	10%	130	15%
MX Taka tak	12	8%	76	9%
Moj	9	6%	67	8%
Discord	12	8%	92	11%
Josh	10	7%	43	5%
Pornographic websites	17	12%	53	6%
Others	6	4%	9	1%
N	**147**		**870**	

Multiple select

Only for those who mentioned that they have access to internet

Key Takeaways:

- Access to the internet was universal, with a higher proportion of adolescents in the intervention group having access compared to the comparison group.
- The majority of adolescents spent more than 30 minutes on the internet daily. Only 6% of adolescents in the comparison group and 9% in the intervention group spent less than 30 minutes on the internet.
- WhatsApp was the most widely used platform for both the comparison and intervention groups.
- In addition to WhatsApp, YouTube, and Instagram were also popular among adolescents in both the comparison and intervention groups.
- A comparatively smaller proportion of adolescents used Facebook, with only 62% in the comparison group and 53% in the intervention group.

5.3 Knowledge, awareness, and perception of users and non-users

After understanding the internet accessibility and usage among the comparison and intervention groups, this section will compare the knowledge and awareness of the two groups on online safety and digital abuse.

5.3.2 Knowledge and awareness on online safety

The knowledge on online safety and digital abuse is divided into multiple themes. The first theme involves understanding internet risks, where their perception and knowledge of risks in using the internet are assessed. The next theme focuses on their knowledge of laws, helplines, and platforms available to report online sexual abuse in India. The third theme provides two situational questions regarding online abuse to understand adolescents' knowledge. Finally, the last theme delves into the sources of knowledge on OCSEA and responsible online behaviour for both users and non-users.

5.3.2a Internet and Social Media Risk

When asked about the perceived risk to safety and privacy on the internet and social media, adolescents in the intervention group were more likely to consider the internet and social media as a high risk to safety and privacy as compared to those in the comparison group. In the intervention group, 41% of adolescents (363) articulated the internet as high risk, while only 21% (32) of adolescents in the comparison group expressed the same view. Conversely, adolescents in the comparison group were more inclined to view the internet and social media as posing no risk to their privacy and safety. 13% of adolescents in the comparison group believed that the internet and social media had no risk to privacy and safety, whereas only 10% in the intervention group shared the same belief. The percentage of responses to their perception of internet and social media safety and privacy is given in the graph below.

Graph 5.2: Respondent's assessment of risk on safety and privacy (N for comparison =152, N for intervention =876)

Internet Risk (in%)
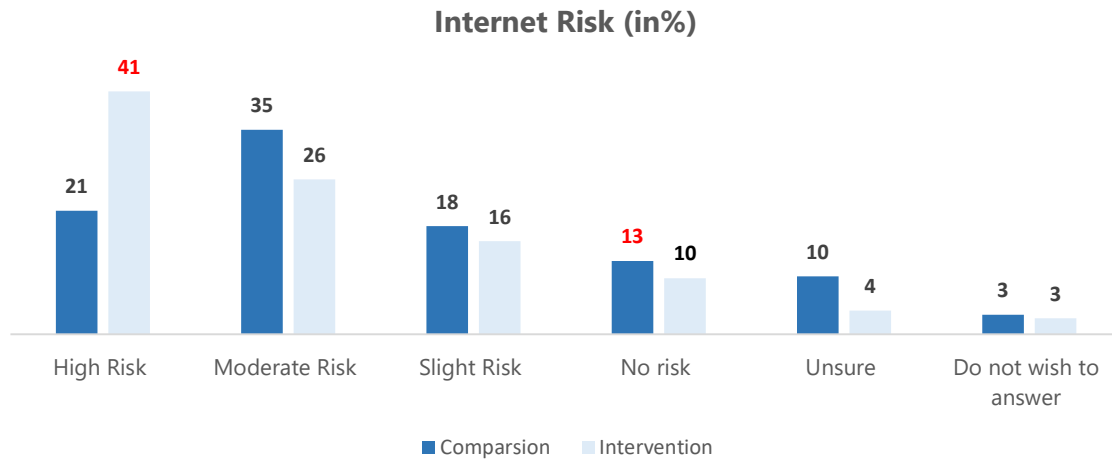
A logit regression model was employed to compare the likelihood of adolescents considering the internet and social media as high risk. The difference between the two groups was found to be statistically significant at 0.01 level (99% confidence). The regression shows that the intervention group is two times more likely than the comparison group to view the internet and social media as high risk to safety and privacy. The table with Odd Ratios and p-values of all 4 models is provided below.

Table 5.2: Logit regression model for internet as high risk

VARIABLES	-1	-2	-3	-4
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Adolescent group #	2.668***	2.668***	2.666***	**2.721***
	-0.563	-0.578	-0.578	-0.593
Constant	0.297***	0.677	0.7	0.829
	-0.108	-0.298	-0.309	-0.741
Observations	1,028	1,017	1,017	1,017
Internet Usage FE^	No	Yes	Yes	Yes
Gender FE	No	No	Yes	Yes
Residence FE	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1
^Fixed effects; # Adolescent group: 1 – Intervention group, 0 – Comparison group

> Chen et al. (2010), in their research, proposed a method for interpreting the size of the Odds Ratios by relating them to the differences in a normal standard deviation. According to their table, an Odds Ratio between 2 to 3 corresponds to a Cohen's d of 0.5, which represents a medium effect size in statistical terms. This indicates that the difference between the two groups being compared is moderate, neither small nor large.

5.3.2b Nature of Risks on the Internet and social media:

Among the adolescents who mentioned that there were risks (slight, moderate, and high) to using the internet and social media, they were asked to specify the nature of these risks. A higher number of adolescents in the intervention group identified risks such as hacking and account takeovers, shared data location, data mining, false information, malware, and OCSEA compared to adolescents in the comparison group. Conversely, a greater number of adolescents in the comparison group were able to recognize clicking on malicious links, impersonation, cyberstalking, fake online relationship, and

cyberbullying as risks compared to adolescents in the intervention group. The responses of the intervention and comparison groups regarding the nature of risks are detailed in the table below.

Table 5.3: Nature of risks on internet and social media

	Comparison		Intervention	
	Responses	% of cases	Responses	% of cases
Hacking and account takeovers	75	66%	542	74%
Clicking on malicious links	69	61%	402	55%
Shared data location	45	40%	316	43%
Data mining	28	25%	218	30%
Impersonation/Identity theft	28	25%	152	21%
Cyberbullying	49	43%	220	30%
Cyberstalking	40	35%	192	26%
False Information	29	26%	213	29%
Malware and viruses	33	29%	227	31%
Fake online relationships	36	32%	215	29%
Online sexual abuse	27	24%	184	25%
Don't know/Can't Say	39	35%	143	20%
N	**113**		**733**	

*Multiple Select
*Only for those who assessed the risk of social media platforms as high, moderate or slight.

5.3.2c Perception regarding the safety of sharing personal information on social media platforms

Adolescents were asked about their views on sharing personal information, such as age, address, name, and phone number, on certain social media platforms. Adolescents from both the comparison and intervention groups mentioned that sharing personal information was 'safe to an extent' on the internet and social media platforms. A greater proportion of adolescents from the comparison group felt that it was 'safe to an extent' to share personal information on Facebook, dating and gaming Apps. An equal proportion of adolescents from both the comparison and intervention groups mentioned Edtech platforms as safe only to an extent for sharing personal information (Table 5.4).

It is interesting to note that a higher proportion of adolescents from the intervention group reported sharing of personal information on social media platforms such as Facebook, chatrooms, dating Apps, and games to be completely safe (Table 5.10, Annexure 2). As seen in section four of this report, the engagement with the SnehAI is limited, and it is highly likely that the users may not have consumed the complete content on online safety. This could possibly be one of the factors explaining the lower risk perception of sharing personal information on platforms among those accessing SnehAI.

Table 5.4: Adolescents who chose safe to an extent option

Safe to an extent		
	Intervention	Comparison
Social Media (FB/insta/X)	41%	53%
Edtech	42%	42%
Chatroom	35%	32%
Dating Apps	27%	35%
Games	40%	42%
N	**876**	**152**

Compilation of "safe to an extent" responses to five questions on risk of sharing personal information on social media platforms mentioned above in the table

Key Takeaways:

- Adolescents from the intervention group demonstrated a better understanding of the risks associated with internet use for privacy and safety
- Compared to the comparison group, more adolescents from the intervention group identified various risks such as hacking, account takeovers, shared data location, data mining, false information, malware, and OCSEA
- Conversely, the comparison group exhibited better awareness of risks related to clicking on malicious links, cyberstalking, cyberbullying, fake online relationships, and impersonation, suggesting a need for additional content on these specific topics
- Although the intervention group showed awareness of the general risks of internet use, they were less likely to recognize the risk of sharing personal information on certain social media platforms. Hence, there is a need for more targeted content on these specific aspects, along with increased efforts to engage users with existing content in these areas

5.3.2bi Knowledge and awareness of laws, helplines, and platforms available to report online sexual abuse in India

In addition to increasing knowledge and awareness of the risks of using the internet, SnehAI also informs its users about existing provisions to report OCSEA. The helpline for OCSEA, in fact, is one of the interactive modules offered in the SnehAI chatbot. Therefore, adolescents in both the comparison and intervention groups were questioned about their knowledge and awareness of existing laws and legal provisions for dealing with OCSEA.

5.3.2 bii Awareness of OCSEA laws/rules in India:

When asked if there are laws or rules in India that prevent OCSEA, more adolescents in the intervention group answered affirmatively compared to the comparison group. 74% adolescents in the intervention group mentioned being aware of laws or rules preventing OCSEA in India, compared to 62% in the comparison group (see graph 5.3).

Graph 5.3: Responses to being aware of laws/rules on OCSEA in India (N for Intervention =876, N for Comparison =152)

Laws on OCSEA in India (in %)

	No	Yes	Don't know/can't say	Do not wish to asnwer
Comparison	10	62	27	1
Intervention	8	74	16	2

■ Comparison ■ Intervention
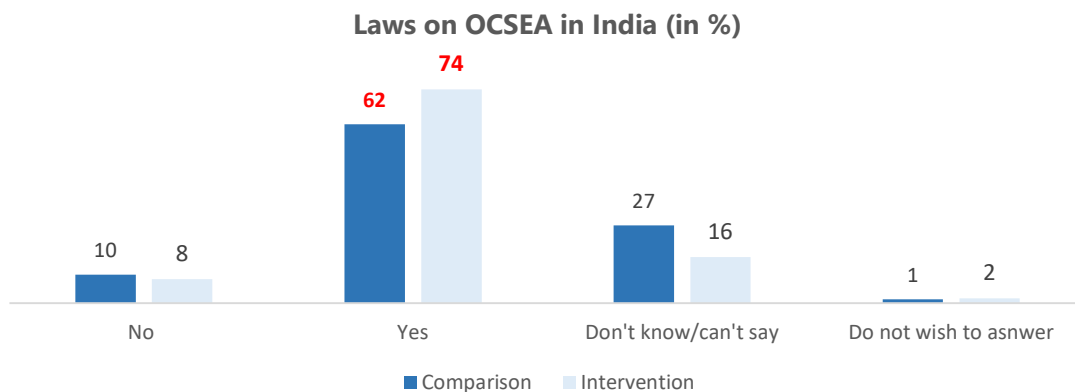
A logit regression model was used to compare the likelihood of adolescents being aware about laws and rules to prevent OCSEA in India. The difference between the two groups was found to be statistically significant at 0.01 level (99% confidence). The regression shows that the intervention group is 1.5 times more likely than the comparison group to be aware of laws and rules to prevent OCSEA in India. The table with Odds Ratios and p-values of all 4 models is provided below.

Table 5.5: Logit regression model for likelihood of being aware of OCSEA laws

	-1	-2	-3	-4
VARIABLES	**Odds Ratio**	**Odds Ratio**	**Odds Ratio**	**Odds Ratio**
Adolescent group#	1.722***	1.668***	1.656***	**1.643*****
	-0.318	-0.317	-0.315	-0.314
Constant	1.109	1.75	1.792	0.927
	-0.382	-0.791	-0.812	-0.81
Observations	1,028	1,017	1,017	1,017
Internet Usage FE^	No	Yes	Yes	Yes
Gender FE	No	No	Yes	Yes
Residence FE	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1
^Fixed effects; # Adolescent group: 1 – Intervention group, 0 – Comparison group

5.3.2b iii Knowledge of OCSEA rules OCSEA laws/rules in India

Adolescents who were aware of OCSEA laws/rules in India were asked to choose the names of some of these rules and laws. More adolescents from the comparison group recognized the Protection of Child from Sexual Offenders (POCSO) Act, the Indian Penal Court (IPC) Act, and the Juvenile Justice Act, while more adolescents from the intervention group were able to identify the Information Technology (IT) Act compared to the comparison group (graph 5.4).

Graph 5.4: Rules/Laws to prevent OCSEA in India (N for Intervention =678, N for comparison =94)

Rules/laws to prevent OCSEA in India (in%)

Law	Comparison	Intervention
IT Act	52	61
POCSO	62	58
IPC	44	27
Juvenile Justice Act	28	26
Other	15	10
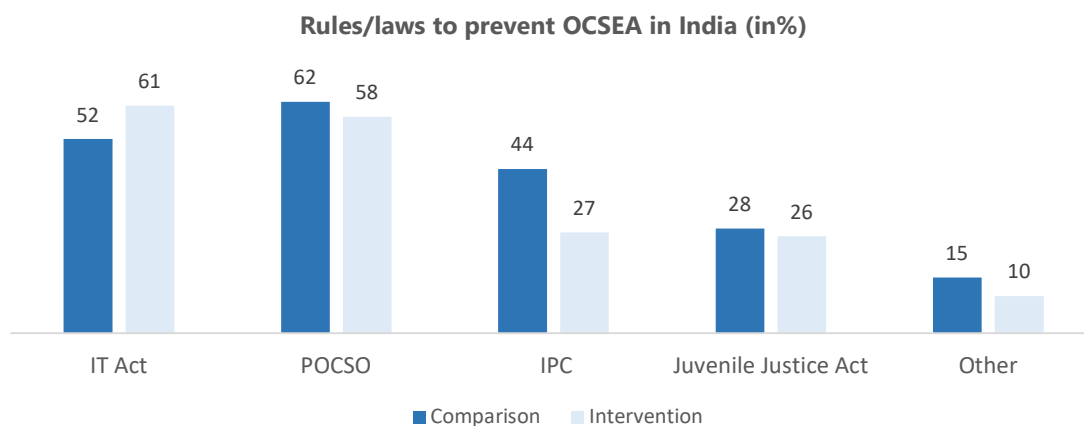
Multiple Select
Only for those who said they were aware of laws and rules to prevent OCSEA in India

Thus, it can be concluded that users of SnehAI were more aware on availability of legal provisions for OCSEA, but lack specific knowledge on names of laws and rules. Hence, SnehAI in some ways has succeeded in starting conversations on OCSEA, but to enable knowledge shift, more engagement on the chatbot is probably required.

5.3.2b iv <u>Awareness of online platforms or helplines for reporting OCSEA</u>

In addition to laws/rules to prevent OCSEA, adolescents were also asked on their awareness of online platforms or helplines for reporting OCSEA. 62% adolescents in intervention group responded affirmatively to being aware of platforms and helplines, in comparison to only 43% in the comparison group.

Graph 5.5: Responses to being aware of platforms/helplines for reporting OCSEA (N for Intervention =876, N for comparison =152)

Platforms/Helpline for reporting OCSEA (in%)
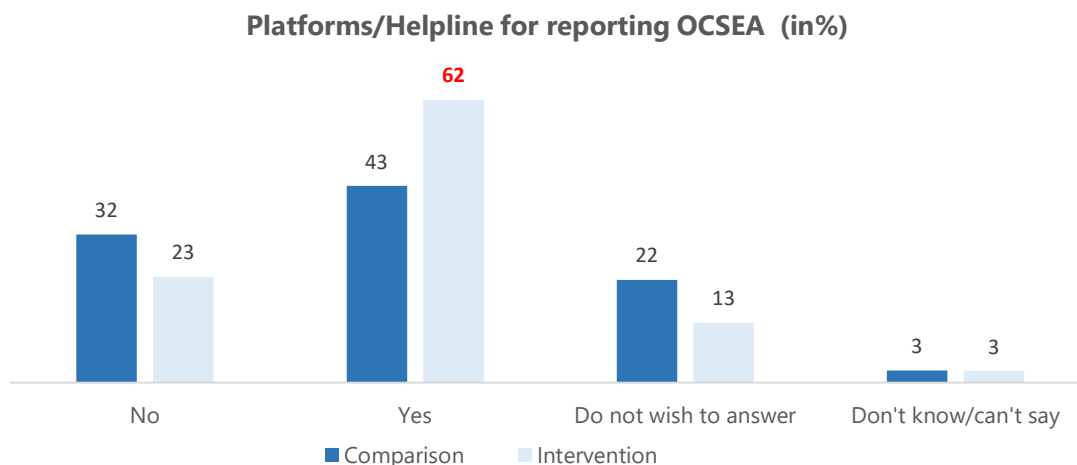
A logit regression model was used to compare the likelihood of adolescents' awareness of online platforms and helplines to report OCSEA in India. The difference between the two groups was found to be statistically significant at 0.01 level (99% confidence). The regression shows that the intervention group is 2 times more likely than the comparison group to know about helplines and platforms for reporting OCSEA in India. The table with Odd Ratios and p-values of all 4 models is provided below.

Table 5.6: Logit regression model for likelihood of knowing about online platforms to report OCSEA

|	-1	-2	-3	-4
VARIABLES	**Odds Ratio**	**Odds Ratio**	**Odds Ratio**	**Odds Ratio**
Adolescent group#	2.068***	2.139***	2.159***	**2.145***
	-0.371	-0.393	-0.398	-0.396
Constant	0.292***	0.393**	0.399**	0.283
	-0.105	-0.174	-0.177	-0.255
Observations	1,028	1,017	1,014	1,014
Internet Usage FE^	No	Yes	Yes	Yes
Gender FE	No	No	Yes	Yes
Residence FE	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1
^Fixed effect; # Adolescent group: 1 – Intervention group, 0 – Comparison group

5.3.2b.v Knowledge of online platforms or helplines for reporting OCSEA

Adolescents who were aware of online platforms or helplines for reporting OCSEA were asked to identify the names of such platforms available in India. More adolescents in the intervention group were able to identify the government online crime reporting portal, National Crime Record Bureau (NCRB), and POCSO e-box. On the other hand, more adolescents in the comparison group were able to identify police stations, Cyber Crime against Women and Children (CPWW), and non-governmental organization (NGO) portals such as Bachpan Bachao Andolan and IWF Arambh India (Table 5.7).

Table 5.7: Platforms for reporting OCSEA

Online platforms for reporting OCSEA		
	Comparison	Intervention
Police station/ cyber cell	83%	73%
Government online crime reporting portal	54%	59%
Cyber Crime Prevention Against Women and Children' (CCPWC)	52%	51%
National Crime Records Bureau	20%	24%
POCSO e-box	23%	24%
Bachpan Bachao Andolan	29%	21%
IWF Arambh India	25%	19%
Others (specify)	2%	2%
N	**65**	**539**

*Multiple select
*Only for those who said that they were aware of platforms to report OCSEA in India

Therefore, adolescents in the intervention group possess a greater awareness of the existence of online platforms and helplines for reporting OCSEA, and were aware of the Government's helplines for the same. There is, however, the need for better knowledge on the specific platforms.

Key Takeaways

- Adolescents in the intervention group showed a better awareness of the laws and rules aimed at preventing OCSEA in India. However, despite being aware of the existence of these laws and rules, they were less likely to mention specific names associated with them
- Regarding awareness of platforms and helplines for reporting OCSEA, adolescents in the intervention group demonstrated a higher level of awareness. Specifically, a greater number of adolescents in the intervention group, compared to the comparison group, were familiar with the government online crime reporting portal and NGO complaint cells
- Conversely, adolescents in the comparison group, in comparison to the intervention group, were more aware of reporting options such as the police station, cyber cell, CCPW, and POCSO e-box

5.3.2c Situational Questions

SnehAI, has been positioned not merely as a question-and-answer bot but as a tool for behavioural change, predominantly featuring content structured to discuss scenarios from everyday life. The approach involves presenting situations, exploring the typical response, and then guiding users toward the appropriate response. To assess the knowledge and awareness of chatbot users and compare it with non-users, everyday situations faced by adolescents were presented, prompting adolescents to choose their course of action. Two situations and the corresponding responses are outlined below.

5.3.2 ci Situation 1: Private Part

In this scenario, adolescents encounter a picture or video on a social media site displaying private parts of people's bodies, causing discomfort. Adolescents were then asked to indicate what they would do in this situation. Four options were provided:

1) Engage with the content or leave a comment,
2) Report the post to the platform for violating community guidelines,
3) Take a screenshot of the content to share with friends for a laugh, and
4) Message the person who posted it and ask them to remove it.

13% of adolescents in the comparison group and 23% of adolescents in the intervention group chose the first option, which involves engaging with the content or leaving a comment. Meanwhile, 67% of adolescents in the comparison group and 56% in the intervention group opted for the second option, which is reporting the content to the platform. A small proportion of adolescents (3% in the comparison group and 6% in the intervention group) selected the third option, which entails taking a screenshot of the content. Additionally, 12% in the comparison group and 11% in the intervention group chose the fourth option, which involves messaging the person and asking them to remove the content (graph 4.6).

Graph 5.6: Responses to private part situational question (N for Intervention =876, N for comparison =152)

Private Part Situation (in%)
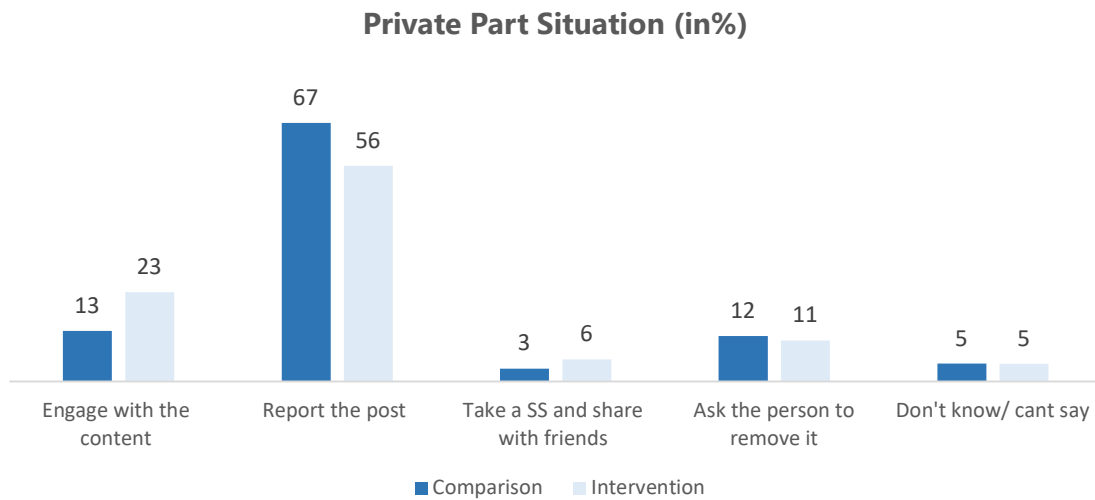
Single select, mandatory question

A logit regression model was employed to compare the likelihood of adolescents' choosing to report such a post with pictures of private parts. The difference between the two groups was found to be statistically significant at 0.01 level (99% confidence). The regression shows that the intervention group is less likely than the control group to report such images to the platform for violating community guidelines. The table with Odd Ratios and p-values of all 4 models is provided below.

Table 5.8: A logit model for likelihood of reporting pictures of private part

	-1	-2	-3	-4
VARIABLES	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Adolescent group#	0.607***	0.620**	0.618**	**0.613****
	-0.113	-0.12	-0.121	-0.12
Constant	1.298	0.309***	0.290***	0.354
	-0.439	-0.136	-0.128	-0.321

Observations	1,028	1,017	1,017	1,017
Internet Usage FE	No	Yes	Yes	Yes
Gender FE	No	No	Yes	Yes
Residence FE	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1

^Fixed effect; # Adolescent group: 1 – Intervention group, 0 – Comparison group

As evident from graph 5.8, in both groups, more than 50% adolescents chose the option of reporting the private photo/ post. However, the comparison group, was statistically more likely to choose it compared to the intervention group.

5.3.2cii Situation 2: Threat Messages

In this scenario, an adolescent's friend informs them about receiving threatening messages from an unknown person on their social media account. The scared friend seeks suggestions from the adolescent, who has four options to choose from:

1. Ignore the messages and hope they go away.
2. Report and block the person sending the messages and make the account private.
3. Send a message back to the person, asking them to stop.
4. Keep talking to the person to find out why they're doing this.

In the comparison group, 14% of adolescents opted for the first option, which is ignoring the messages. Meanwhile, 67% in the comparison group and 58% in the intervention group chose the second option, involving blocking and reporting the person. 9% in each group selected the third option, messaging the person and asking them to stop sending threatening messages. Additionally, 7% in the comparison group and 8% in the intervention group opted for the last option, engaging with the person to understand their motive.

Graph 4.7: Response to threat message situational question

Threat Message Situation (in %)
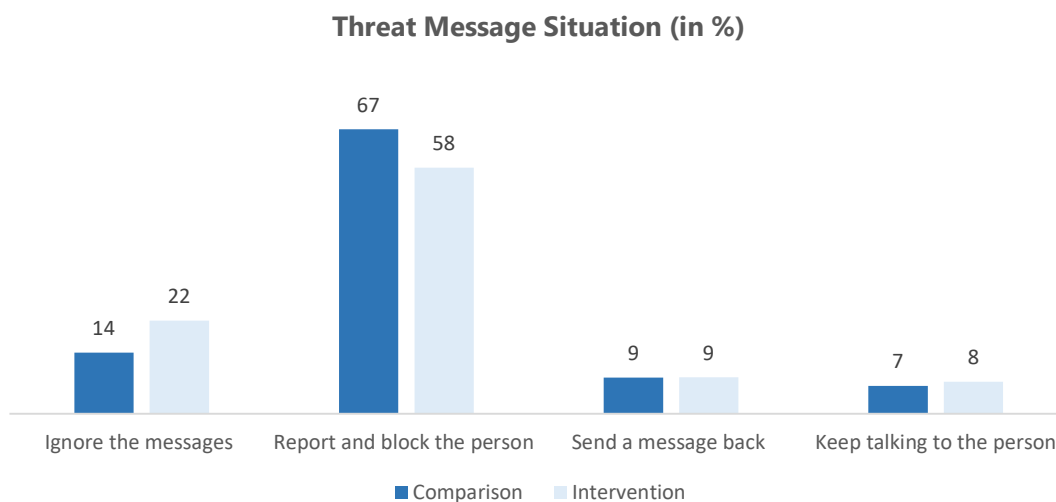
A logit regression model was used to compare the likelihood of adolescents opting for option 2, which is reporting and blocking the person sending messages and making the account private. The difference between the two groups was found to be statistically significant at a 95% confidence level. The intervention group was found to be less likely to report and block the person sending threats than the comparison group. The table with scores and p-values of all 4 models is provided below.

Table 5.9: Logit regression model for likelihood of reporting and blocking

VARIABLES	-1 Odds Ratio	-2 Odds Ratio	-3 Odds Ratio	-4 Odds Ratio
Adolescent group#	0.667**	0.671**	0.674**	**0.661****
	-0.124	-0.131	-0.132	-0.13
Constant	1.471	0.303***	0.286***	0.144**
	-0.498	-0.135	-0.129	-0.125
Observations	1,022	1,011	1,011	1,011
Internet Usage FE	No	Yes	Yes	Yes
Gender FE	No	No	Yes	Yes
Residence FE	No	No	No	Yes

*** p<0.01, ** p<0.05, * p<0.1
^Fixed effect; # Adolescent group: 1 – Intervention group, 0 – Comparison group

Similar to the previous situation, the majority of adolescents in both the groups chose the option of reporting and blocking the person and making the profile private. Here as well, the comparison group was more likely to choose this option over the intervention group.

Therefore, there is a need for increased engagement with adolescents on the bot to address day-to-day situations related to online safety. Currently, the majority of adolescents do not go beyond the introduction when engaging with the chatbot. Consequently, they miss out on the content that provides details on OCSEA. To effectively bring about behavioural change, there is a need to improve user engagement with the content.

Key Takeaways:

- Majority of adolescents in both groups opted for the option of reporting the picture and the person sending the messages. Thus, showing that there is a general level of awareness of the right course of action in such situations.
- Despite the general level of awareness in both groups, comparison group is more likely to choose the option of reporting as compared to the intervention group

5.3.2.d Sources of Information on OCSEA

When asked about sources of information on OCSEA, both groups mentioned multiple sources ranging from the internet to family members. For more than 50% of the adolescents in the intervention group, SnehAI was a source of information on OCSEA. Apart from SnehAI, the intervention group depended on school teachers, the internet, and social media platforms for information on OCSEA. On the other hand, the comparison group depended on school teachers, parents, the internet/google, friends and siblings, and social media platforms for information on OCSEA.

31% of adolescents in the control group mentioned SnehAI as a source of information. This can be due to the online nature of the study. As the study was online, there was very limited control on the nature of the responses which could have potentially led to unexpected or inaccurate information from participants in the comparison group.

Graph 5.7: Sources of information on OCSEA and safe online behaviour (N for intervention =876 and comparison = 152)

Sources of Information (in %)

	SnehAI chatbot	School Teachers	Parents	Internet/google	Books and Magazines	Friends and siblings	Trainings/information by NGO	Social media platforms	No sources of information	Others (specify)
Comparison	31	38	34	49	18	34	14	32	5	5
Intervention	56	36	28	46	18	24	17	28	6	5

■ Comparison   ■ Intervention
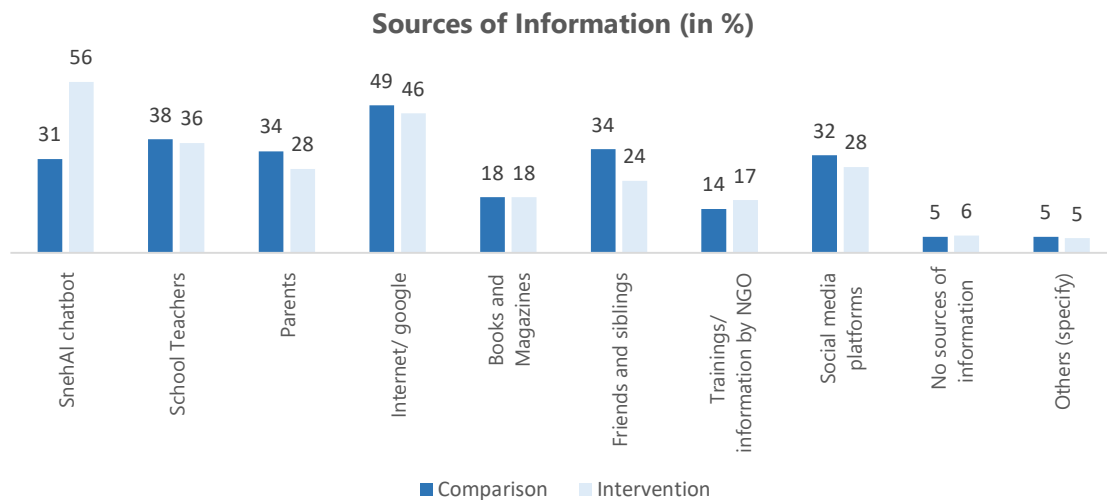
Multiple choice

5.4 User Feedback

In this section, we delve into the experiences and feedback of adolescents in the intervention group who engaged with the SnehAI chatbot.

5.4.1 Experience using the chatbot

Among the 876 adolescents in the intervention group, 82% (712) recalled interacting with the SnehAI chatbot. Of these, over 80% mentioned engaging with the chatbot more than once.

> This is in contrast to the findings from the secondary analysis, which showed that only 44% of users came back to the chatbot. This difference could be attributed to the 'incentive bias' in the online survey. As the survey was pushed through SnehAI chatbot and had compensation attached to it, adolescents might have provided more positive or favourable responses than their true opinions.

The remaining 164 adolescents who did not interact more than once reported the following reasons: 52% found the first interaction sufficient, 26% were unaware of the possibility of further interactions, 9% faced technical issues, and 10% disliked the initial interaction (table 5.11, annexure 2).

Of the 712 adolescents who engaged multiple times, 34% interacted daily, and 26% interacted at least once a week. In terms of content preference, 76% found stories to be the easiest and most interesting, followed by 48% for games and 45% for videos (table 5.12, annexure 2).

5.4.2 Feedback on using the chatbot

Based on their interaction with SnehAI, adolescents were asked to provide feedback on two aspects: (i) ease of using the chatbot and (ii) ease of applying the information shared.

5.4.3 Ease of using the chatbot

63% of adolescents found SnehAI very easy to use. Another 25% found it somewhat easy, while only 9% found it somewhat difficult, and a mere 3% found it very difficult. In summary, 88% found the chatbot easy to use, combining those who found it very easy and somewhat easy (table 5.13, annexure 2).

In terms of ease of using the chatbot, females were slightly more likely to rate the ease of using the chatbot as 'very easy' compared to males (68% for females compared to 62% for males). For more details, refer to table 5.14 in annexure 2.

5.4.4 Ease of Applying Information in Real Life:

87% affirmed that information learned from SnehAI can be easily applied in real-life situations. Among them, 57% found it very easy, and 30% found it somewhat easy (table 5.15, annexure 2).

Similar to the ease of using the chatbot, females were more likely to find the learning from the chatbot easy to apply in real life (60% for females versus 57% for males). For more details, refer to table 5.16 in annexure 2.

5.4.5 Confidence in Practicing Safe Online Behaviour:

Adolescents rated their confidence in practicing safe online behaviour after engaging with SnehAI content on a scale of 1 to 100. The average rating was 80 out of 100.

The above section highlights positive feedback from adolescents regarding the chatbot, emphasizing its ease of use and practical applicability. Users expressed increased confidence in practicing safe online behaviour due to the chatbot.

Thus, it can be concluded that though adolescents did not delve into the content in detail (as observed in Section 4) they find the chatbot's features, graphics, and user interface appealing. Based on their initial experiences, adolescents have overall positive feedback for the chatbot.

Key Takeaways:

- Over 80% of users interacted with the chatbot more than once.
- Stories were the most favoured content type, chosen by 76% of users.
- A significant majority (88%) found SnehAI easy to use, with only 3% reporting it as very difficult.
- An impressive 87% found information learned from SnehAI easy to apply in real-life situations.
- Users expressed a high average confidence level (80 out of 100) in practicing safe online behaviour after engaging with the chatbot

Conclusion and Recommendations

Section 6: Conclusion and recommendations:

The objective of this evaluation was to assess the chatbot SnehAI for its effectiveness, usability, and impact on the knowledge and awareness of adolescents. In light of the results and findings discussed in previous sections, the conclusion will focus on answering three questions: (i) What aspects did the chatbot excel in? (ii) What areas require improvement? (iii) What is the way forward for the chatbot?

What aspects did the chatbot excel in?

- Since its establishment in 2019, SnehAI has been positioned as a chatbot aiming to establish a safe space for young people to engage in conversations on topics like online sexual abuse and digital safety, subjects not commonly addressed in everyday discourse. During discussions with various members of the SnehAI program team, a term that consistently surfaced while articulating the chatbot's vision was to serve as "an elder sister" and "a trusted friend" to young adolescents.

- Building upon this vision, an analysis of secondary data revealed that SnehAI has succeeded in reaching over 1.5 lakh unique users in a relatively short period of 16 months. The chatbot has also witnessed exponential year-on-year growth, with unique users doubling from 2022 to 2023. With this widespread reach, SnehAI has the potential to impact lakhs of lives with just a few clicks.

- In addition to reaching lakhs of young adolescents, SnehAI has also succeeded in starting conversations on OCSEA. Adolescents from the intervention group were better aware of risks to privacy and security of using the internet, laws, and rules to prevent OCSEA and online platforms for reporting OCSEA. On these three aspects, the intervention group had statistically higher levels of awareness as compared to the comparison group at a 99% confidence level.

- The chatbot has also been successful in retaining the attention of user for an average of 2.3 minutes which is considerably high given the short attention span in today's day and age.

- Along with widespread reach, holding attention of users over 2.3 minutes, and improving awareness of its users, SnehAI has also received positive feedback from its users. Over 88% of its users found it easy to use, and over 87% found the learning from the chatbot easy to implement in everyday life.

- Thus, it can be concluded that SnehAI has successfully reached a large number of adolescents, initiated conversations on OCSEA, retained user attention for the first few minutes, and provided a positive experience to the user during those initial minutes.

What areas require improvement?

- Despite reaching a wide audience, SnehAI faced challenges in engaging users with the content. Only a small proportion of users actually viewed the content beyond introduction. According to message-level analysis, 1.9% of total users who visited the chatbot viewed the first level of the story on Facebook. The situation was slightly better on WhatsApp, with 12% viewing the story.

- Due to low engagement, users, though aware of OCSEA and laws preventing it, were less likely to articulate names of laws and policies, assess risks of social media platforms, and provide appropriate responses in situational questions compared to the comparison group. Additionally, adolescents in the intervention group were less likely than those in the comparison group to report the person sending threat messages in the situational question. To bring about behaviour change, there is a need to engage users more on the chatbot.

- Additionally, the chatbot needs to focus on getting repeat users. According to secondary data, only 29% of users come back to the chatbot after using it once. This percentage needs improvement to bring about behaviour change. In the online survey, when adolescents were asked their reasons for not visiting the chatbot again, 26% mentioned that they did not know that there was an option to visit the chatbot again. Hence, more messages can be added to engage the chatbot.

What is the way forward for the chatbot?

In light of the above discussion, the following strategies can be adopted to make the chatbot more engaging for young adolescents:

More rigorous feedback and evaluation:
To gain better insights into chatbot engagement, including the content users engage with, reasons for disengagement at particular points, and preferences, future studies can be conducted with a more rigorous approach, preferably adopting a longitudinal design. Such studies would allow for the comparison of two groups: one exposed to the chatbot and another not exposed, over an extended period.

Enhanced Promotion of WhatsApp:
Considering that WhatsApp has shown better engagement compared to Facebook (more average user messages and better retention till the last step of the content) despite a comparatively lower reach, enhanced promotion and diversification of content on WhatsApp should be considered.

Daily Updates in the Form of Fact/Question of the Day:
As mentioned earlier, the focus of the chatbot in the next phase should be on improving user engagement. Hence, some daily updates can be provided on the chatbot, for which a notification will be sent to the user. The daily update will serve two purposes: (i) it will send out notifications to all the users, increasing their chances of visiting the chatbot again and exploring other content, and (ii) it will improve the knowledge of users through the update.

Reduce the Number of Steps to Reach the Content:
In its current form, it takes several steps for the user to reach the interactive modules (games, videos, and stories). As a result, only a small proportion actually ends up viewing this content. The flow of the chatbot can be redesigned so that the interactive modules appear on the screen without going through multiple steps, thereby reducing the chance of losing users at each step.

Holding User's Attention in the First 2 Minutes:
As established from the secondary analysis, a user, on average, spends 2.3 minutes on the chatbot. Given this information, the focus of the chatbot should be on holding the user's attention in their first 1-2 minutes. This strategy can help improve user retention.

Introducing feature of voice notes:
As mentioned in Section 3, SnehAI has consistently kept pace with changing times, evolving from a click-based bot to a text-based bot. Recent research indicates that voice notes are more advanced than text-based bots. Studies have shown that speech exhibits higher perceived efficiency, lower cognitive effort, greater enjoyment, and increased service satisfaction compared to text-based interactions (Rzepka, Berger, & Hess, 2022). Therefore, this could be a potential next step for SnehAI. Introducing the feature of voice notes would enhance its accessibility and comprehensibility.

Proving options for personalisation:
Previous studies on the evaluation of AI-based chatbots for mental health and language learning (Belda-Madina et al., 2023; Haque & Rubya, 2023) have shown that the freedom to personalize features, such

as the option to address users by name, create customized avatars (including age, gender, etc.), and the ability to respond with pleasant and positive sentiments, helps enhance the human personalization of the chatbot. More personalisation features can be added to SnehAI to improve user engagement.

Annexure 1:

Graph 4.1 Day wise unique users on SnehAI-Facebook (N=1,14,891)

Unique users on different weekdays –FB
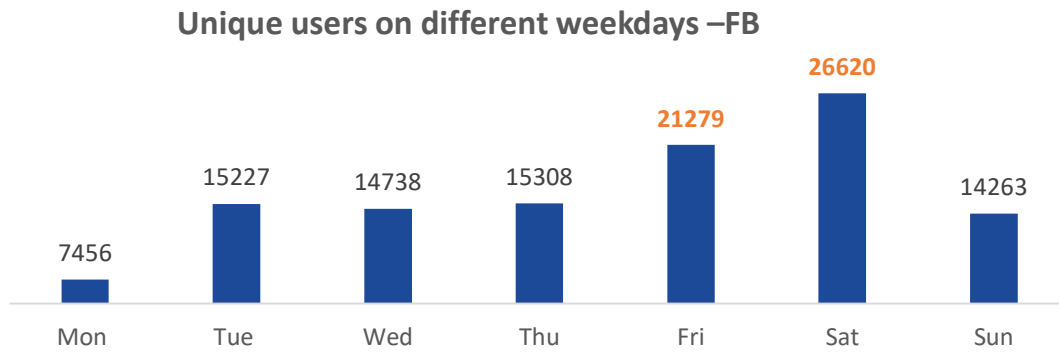
Graph 4.2 Day wise unique users on SnehAI – WhatsApp (N= 58,026)
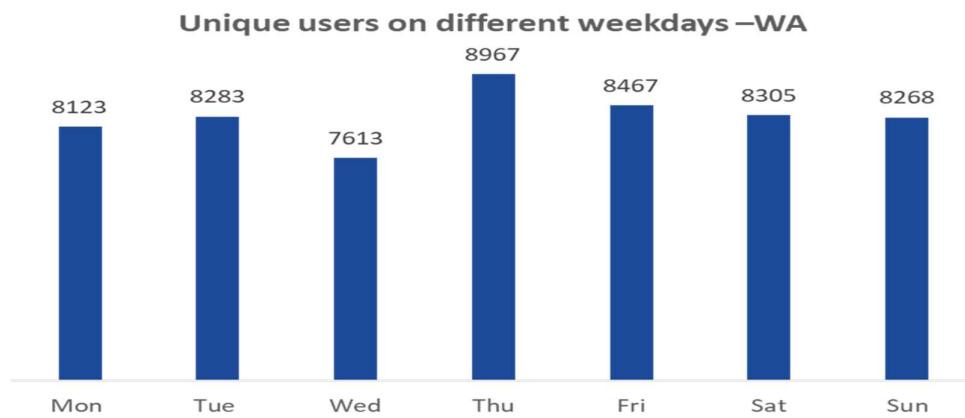
Graph 4.3: Hours of the day wise unique users on SnehAI (both Facebook and WhatsApp)

N = 1,52,714
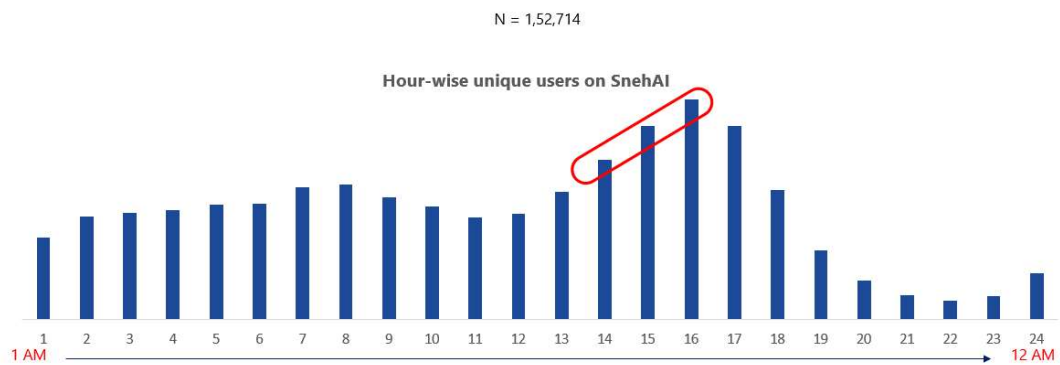
Figure 4.1: Funnel of attrition on SnehAI games

		Facebook	WhatsApp
Users who visited SnehAI		65,691	35,023
Users who opted for OCSEA		29,839	8556
Users who opted for games		744	1381
Users who went to the first step of the game		299	890
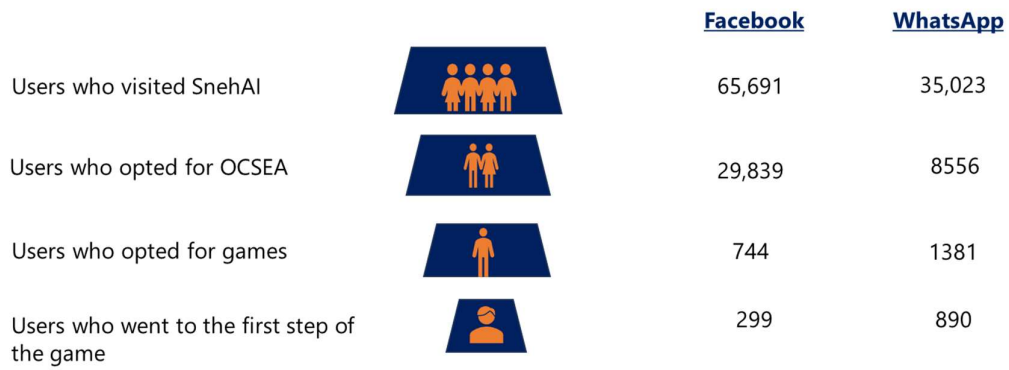
Figure 4.2: Funnel of attrition on SnehAI videos

		Facebook	WhatsApp
Users who visited SnehAI		65,691	35,023
Users who opted for OCSEA		29,839	8556
Users who opted for Videos		5263	5318
Users who went to vidoes		3054	2442
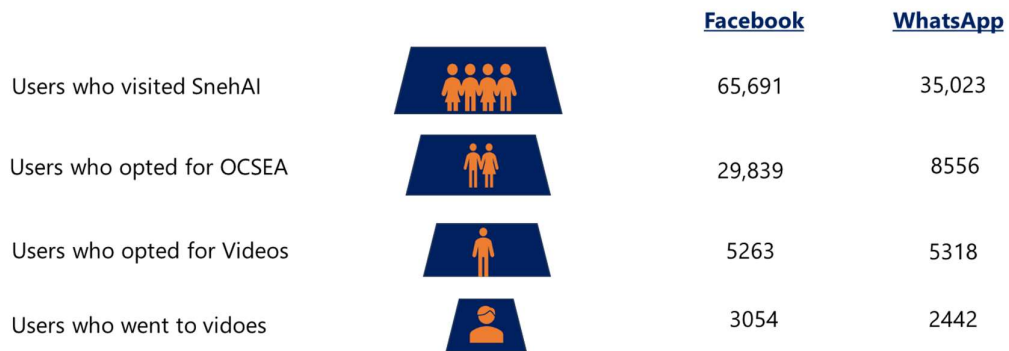
Annexure 2

Table 5.1 Residence type

How would you describe your current place of residence?						
	Comparison	Comparison %	Intervention	Intervention %	Total	Total %
Others	3	2	5	1	8	1
Rural	65	43	362	41	427	42
Urban	84	55	509	58	593	58
Total	152	100	876	100	1028	100

Single select, mandatory question

Table 5.2 State of residence

Which state do you currently reside in?						
	Comparison	Comparison %	Intervention	Intervention %	Total	Total %
Others	20	13	242	28	262	25
Bihar	18	12	94	11	112	11
Chhattisgarh	12	8	15	2	27	3
Haryana	13	9	41	5	54	5
Himachal Pradesh	3	2	6	1	9	1
Jharkhand	9	6	27	3	36	4
Delhi	16	11	118	13	134	13
Madhya Pradesh	12	8	68	8	80	8
Rajasthan	16	11	79	9	95	9
Uttar Pradesh	27	18	172	20	199	19
Uttarakhand	6	4	14	2	20	2
Total	152	100	876	100	1028	100

Single select, mandatory question

Table 5.3 Gender of the adolescents

What is your gender?						
	Comparison	Comparison%	Intervention	Intervention%	Total	Total%
Male	126	83	745	85	871	85
Female	24	16	129	15	153	15
Transgender	2	1	2	0	4	0
Total	152	100	876	100	1028	100

Single select, mandatory question

Table 5.4: Family structure of adolescents

In terms of your family, which of the following best describes your current family						
	Comparison	Comparison%	Intervention	Intervention%	Total	Total %
Others	3	2	6	1	9	1
Single-parent	26	17	124	14	150	15
Nuclear (mother, father, siblings)	79	52	494	56	573	56
Joint (parents, children, and extended family like aunt, uncle, cousins etc. living together)	44	29	252	29	296	29
Total	152	100	876	100	1028	100

*Single select, mandatory question

Table 5.5 School Type

Which grade are you currently enrolled in?						
	Control	Control %	Intervention	Intervention %	Total	Total %
11th grade	12	9	55	6	67	7
12th grade	42	30	203	24	245	25
Polytechnic/Diploma(After 12th standard)	10	7	96	11	106	11
1st year Bachelor degree	44	31	263	31	307	31
2nd year Bachelor degree	32	23	230	27	262	27
Total	140	100	847	100	987	100

*Single select
*There is a skip logic. Respondents who said yes to the question "Are you currently studying" answered this question

Table 5.6: Last educational qualification

In which grade did you last study?						
	Comparison	Comparison %	Intervention	Intervention %	Total	Total %
3rd Grade	0	0	1	3	1	2
4th Grade	0	0	1	3	1	2
5th Grade	1	8	0	0	1	2
7th Grade	1	8	0	0	1	2
8th Grade	2	17	0	0	2	5
9th Grade	1	8	2	7	3	7
10th Grade	2	17	3	10	5	12
11th Grade	1	8	1	3	2	5
12th Grade	0	0	14	47	14	33
Polytechnic/Diploma(After 10th standard)	1	8	0	0	1	2

Polytechnic/Diploma(After 12th standard)	1	8	0	0	1	2
1st year Bachelor degree	0	0	3	10	3	7
2nd year Bachelor degree	2	17	5	17	7	17
Total	12	100	30	100	42	100

Single select

There is a skip logic. Respondents who said no to the question "Are you currently studying" answered this question

Table 5.7: Type of school attended

Which type of school did you attend last/ are currently attending?						
	Control	Control %	Intervention	Intervention %	Total	Total %
Others	2	1	24	3	26	3
Government School	53	35	268	31	321	31
Private School	45	30	237	27	282	27
Government Inter college	23	15	174	20	197	19
Private Inter college	29	19	164	19	193	19
Dropped out of school	0	0	9	1	9	1
Total	152	100	876	100	1028	100

Single select, mandatory question

Table 5.8: chi-square test on demographic variables

	Comparison	Intervention	Total
Are you currently studying?			
No	12	30	42
	7.89	3.42	4.09
Yes	140	846	986
	92.11	96.58	95.91
Total	152	876	1028
	100	100	100
Chi Square = 6.6045			
P-value = .01017			
What is your gender?			
Male	126	745	871
	82.89	85.05	84.73
Female	24	129	153
	15.79	14.73	14.88
Transgender	2	2	4
	1.32	0.23	0.39
Total	152	876	1028
	100	100	100
Chi Square = 4.105			
P-value = .1283			
Which grade are you currently enrolled in?			

11th grade	12	55	67
	8.57	6.49	6.79
12th grade	42	203	245
	30	23.97	24.82
Polytechnic/Diploma(After 12th standard)	10	96	106
	7.14	11.33	10.74
1st year Bachelor degree	44	263	307
	31.43	31.05	31.1
2nd year Bachelor degree	32	230	262
	22.86	27.15	26.55
Total	140	847	987
	100	100	100
Chi Square = 5.3323			
P-value = .254861			
In which grade did you last study?			
3rd Grade	0	1	1
	0	3.33	2.38
4th Grade	0	1	1
	0	3.33	2.38
5th Grade	1	0	1
	8.33	0	2.38
7th Grade	1	0	1
	8.33	0	2.38
8th Grade	2	0	2
	16.67	0	4.76
9th Grade	1	2	3
	8.33	6.67	7.14
10th Grade	2	3	5
	16.67	10	11.9
11th Grade	1	1	2
	8.33	3.33	4.76
12th Grade	0	14	14
	0	46.67	33.33
Polytechnic/Diploma(After 10th standard)	1	0	1
	8.33	0	2.38
Polytechnic/Diploma(After 12th standard)	1	0	1
	8.33	0	2.38
1st year Bachelor degree	0	3	3
	0	10	7.14
2nd year Bachelor degree	2	5	7
	16.67	16.67	16.67
Total	12	30	42
	100	100	100
Chi Square = 23.403			

Which type of school did you attend last?			
Others	2	24	26
	1.32	2.74	2.53
Government School	53	268	321
	34.87	30.59	31.23
Private School	45	237	282
	29.61	27.05	27.43
Government Inter college	23	174	197
	15.13	19.86	19.16
Private Inter college	29	164	193
	19.08	18.72	18.77
Dropped out of school	0	9	9
	0	1.03	0.88
Total	152	876	1028
	100	100	100
Chi Square = 5.18709			
P-value = .393476			
How would you describe your current place of residence?			
Others	3	5	8
	1.97	0.57	0.78
Rural	65	362	427
	42.76	41.32	41.54
Urban	84	509	593
	55.26	58.11	57.68
Total	152	876	1028
	100	100	100
Chi Square = 3.5217			
P-value = .171898			
which of the following best describes your current family structure ?			
Others	3	6	9
	1.97	0.68	0.88
Single-parent	26	124	150
	17.11	14.16	14.59
Nuclear (mother, father, siblings)	79	494	573
	51.97	56.39	55.74
Joint (parents, children, and extended family like aunt, uncle, cousins etc. living together)	44	252	296
	28.95	28.77	28.79
Total	152	876	1028
	100	100	100
Chi Square = 3.6849			
P-value = .29755			
Do you access the internet on a phone/ computer/ laptop ?			
No	5	6	11

		3.29	0.68	1.07
Yes		147	870	1017
		96.71	99.32	98.93
Total		152	876	1028
		100	100	100
Chi Square = 8.3002268				
P-value = .00396				
On a given day, how much time do you use the internet?				
<30 mins		9	74	83
		6.12	8.51	8.16
30 min - 1 hr		34	115	149
		23.13	13.22	14.65
1 hr - 2 hrs		24	179	203
		16.33	20.57	19.96
2 hrs - 3 hrs		29	205	234
		19.73	23.56	23.01
>3 hrs		45	260	305
		30.61	29.89	29.99
6		6	37	43
		4.08	4.25	4.23
Total		147	870	1017
		100	100	100
Chi Square = 11.2779				
P-value = .04614				
**First row has *frequencies* and second row has *column percentages*				

Table 5.9: Time spent on internet

On a given day, how much time do you use the internet?						
	Comparison	Comparison %	Intervention	Intervention %	Total	Total %
<30 mins	9	6	74	9	83	8
30 min - 1 hr	34	23	115	13	149	15
1 hr - 2 hrs	24	16	179	21	203	20
2 hrs - 3 hrs	29	20	205	24	234	23
>3 hrs	45	31	260	30	305	30
Don't know/Can't Say	6	4	37	4	43	4
Total	147	100	870	100	1017	100

*Single select
*There is skip logic. Only those who mentioned having access to internet were asked this question

Table 5.10: "Safe to an extent" and "completely safe" responses to sharing personal information on social media platforms

	Safe to an extent		Completely Safe	
	Intervention	Comparison	Intervention	Comparison

Social Media	41%	53%	33%	19%
Edtech	42%	42%	42%	45%
Chatroom	35%	32%	24%	20%
Dating Apps	27%	35%	21%	13%
Games	40%	42%	28%	22%

Responses of 5 questions have been compiled. Adolescents were asked to share their opinion on risk of sharing personal information on above mentioned social media platforms. Respondents who said "safe to an extent" and "completely safe" have been compiled.

Table 5.11 Reasons for not visiting SnehAI more than once

Why haven't you interacted with SnehAI bot more than once?	Freq.	Percent	Cum.
I found the initial interaction sufficient for my needs	56	52	52
I did not find the initial interaction helpful and hence decided not to interact with the chatbot again	11	10	63
I wasn't aware that I could interact with SnehAI more than once	28	26	89
I encountered technical issues preventing me from interacting again	1	1	90
Faced issues with internet connection and couldn't access the SnehAI bot again	9	8	98
Others specify	2	2	100
Total	107	100	

Single choice
Only for intervention group
* Only for those who said that they have not interacted with SnehAI more than once

Table 5.12 Most preferred interactive module on SnehAI

	Frequency	Responses%	%of cases
Stories	537	45.13	76
Games	339	28.49	48
Videos	314	26.39	44
N	712	100	

Multiple select
* Only for those in the intervention group who have interacted with SnehAI

Table 5.13 Ease of using the chatbot

How would you describe the ease of using the SnehAI chatbot?	Freq.	Percent	Cum.
Very easy	449	63.06	63.06
Somewhat easy	177	24.86	87.92
Somewhat difficult	61	8.57	96.49

Very difficult	17	2.39	98.88
Don't know/ can't say	8	1.12	100.00
Total	712	100.00	

Single select

Only for those in the intervention group who have interacted with SnehAI

Table 5.14: Gender wise responses to ease of using the chatbot

	Ease of using the chatbot				
	Very Easy	Somewhat easy	Somewhat difficult	Very difficult	Don't know/Can't Say
Female	68%	25%	5%	2%	1%
Male	62%	25%	9%	2%	1%
Transgender	50%			50%	

Single select

* Only for those in the intervention group who have interacted with SnehAI

* Only 2 adolescents identified as transgender. Results to be read in following light.

Table 5.15 Applicability of lesson learned in real life

Do you find that the information you've learned from SnehAI is easy to apply in	Freq.	Percent	Cum.
Very easy	410	57.58	57.58
Somewhat easy	210	29.49	87.08
Somewhat difficult	60	8.43	95.51
Very difficult	19	2.67	98.17
Don't know/ can't say	13	1.83	100.00
Total	712	100.00	

**Single select*

* Only for those in the intervention group who have interacted with SnehAI

Table 5.16: Gender wise responses of applicability of A lesson learned from chatbot in real life

	Ease of applying information in real life				
	Very Easy	Somewhat easy	Somewhat difficult	Very difficult	Don't know/Can't Say
Female	60%	30%	5%	2%	3%
Male	57%	29%	9%	3%	2%
Transgender	50%			50%	

Single select

* Only for those in the intervention group who have interacted with SnehAI

* Only 2 adolescents identified as transgender. Results to be read in following light

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