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Impact of CSAT on Level of Awareness of Adolescents at Selected School of Southern Part of India

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Abstract: There is increased exposure to cybercrime among children and adolescents. The current study was planned to create Cyber Security Awareness Training (CSAT) to assess its impact on high school students' awareness levels. Convenience sampling was used to select a sample of 100 students for the one group pre-test-post-test design. The participants baseline data and Internet use profile was assessed. A pre-post assessment of the level of awareness was conducted at a one-week interval to evaluate participants' awareness levels after the CSAT, using a structured questionnaire. Analysis of the data was done with Statistical Package for Social Sciences (SPSS) version 28. The statistical analysis revealed significant difference in level of awareness among the participants. The study highlights the need for validating and integrating cybersecurity education into school mental health programs or curricula as an additional measure to enhance awareness.

Keywords: *Cybersecurity, Cybersafety, Cybercrime, School, Students, Adolescents.*

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I. INTRODUCTION

With the increased use of technology, the internet has become an important part of life. Information and Communication Technology (ICTs) has a great impact on the daily lives of adults, adolescents, and children. Children and teenagers represent a wide segment of the population who uses the internet and web technologies for educational and personal purposes. But one of the negative use of ICTs is using them for perpetuating crimes by hacking personal accounts, Online fraud. These are crimes against property, individuals, groups and firms [1,2].

In India, there has been a notable surge in reports of cybercrimes, particularly in the tech-savvy state of Karnataka, where the majority of cases involve children. Complaints of cybercrime increased by 61%, rising from 9.66 lakh in 2022 to 15.6 lakh in 2023. The cybercrime rate per lakh population in 2023 was 129, with Delhi showing the highest rate at 755, followed by Haryana at 381 and Telangana at 261 [3]. National Crime Report Bureau (NCRB) 2022 reported 13,534 cases of cybercrime in 19 metro cities where Bengaluru showed 9,940 cybercrime cases. This is 24% rise in cases from last year [4]. Also, it included 32% increase in number of cybercrimes against children [5]. Additionally, Mumbai reported 1,171 cases of cyber pornography/hosting or publishing obscene sexual materials depicting children, 158 cases of cyber stalking/bullying, and 416 other cases of cybercrimes against children [5]. The psychological and emotional impact of cybercrimes on children is profound. Victims often exhibit symptoms such as depression, anxiety, fear, somatization, hostility, panic, suicidal tendencies, isolation, paranoia, loss of trust, and aggression. These experiences can significantly impair their ability to interact with others, potentially leading to depression and post-traumatic stress disorders (PTSD) [6,7]. Numerous studies have highlighted a lack of awareness among adolescents, both male and female, regarding cybercrimes, including phishing, cyberbullying, cyberstalking, exposure to pornography, receiving threatening messages, and identity theft. Certain online behaviors, such as sharing private information, images, and phone numbers with strangers met online or clicking on trojan links to play games, indicate a high risk of falling victim to cybercrimes [10-14]. Therefore, there is a pressing need for cyber safety practices and education among adolescents. To date, no research has been conducted in India to raise awareness, identify, and manage cyber

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threats and hazards. Current research aims to validate Cybersecurity Awareness programs aimed at enhancing knowledge and providing ways to safeguard against cyber threats and hazards.

II. METHODOLOGY

Aim of the study was to develop a Cybersecurity awareness Training (CSAT) module to improve awareness of cybersecurity among adolescents.

A. Objectives

- To assess the level of awareness regarding Cyber Security among adolescents.
- To develops a Cyber Security Awareness Training (CSAT) for adolescents.
- To evaluate the feasibility of the CSAT among adolescents of southern part of India.

B. Hypotheses

H01: There will be no statistically significant change in awareness on Cyber Security among high school students after the CSAT at $p < 0.05$ level.

➢ *Study Design*

A pre-experimental design: One group pretest post-test experimental design to assess impact of CSAT.

➢ *Participants:*

School students studying in 8th and 9th standard of Bangalore were selected for the study with the permission of school authorities. Students were recruited for the study using convenience sampling technique.

The initial sample size for this study consisted of 161 participants. However, out of these, 44 parents declined to provide consent, and data from 17 participants were incomplete. As a result, only 100 participants met the inclusion criteria and completed the questionnaire, forming the final sample size for analysis.

➢ *Tools*

Sociodemographic details, Internet Use Profile and Structured Questionnaire on Cyber Security Awareness

- Baseline information sheet: To gather the sociodemographic variables of the high school students. It includes age, gender and standard.
- Internet Use Profile: Consists of hours of social media use, purpose, experiences of cybercrime.
- Structured Questionnaire on Cyber Security Awareness: Consists of 8 questions with four options out of which one is correct. The 9th question consisted of 16 statements where students have to tick whether safe or unsafe behavior is in view of cybersecurity awareness.

The Structured Questionnaire for assessing Cyber Security awareness was developed by reviewing literature, Government websites and content validity was ensured by valuable suggestions from experts in the field of Mental Health with more than 5 years of experience. The Structured Questionnaire contained 8 MCQs and 16 statements, making total score of 27. The test- retest reliability was 0.85.

Cyber Security Awareness Training (CSAT) module was developed by reviewing existing literatures, online content (booklets, manuals) from Government of India. The content was written in simple English focused on identification and safeguard from cyber risks and threats. The content validity was ensured by valuable suggestions from experts in the field of Mental health with more than 5 years of experience.

C. Ethical consideration

This study got the approved of the Institute Ethics Committee (protocol number = NIMH/DO/BEH. Sc. Div/2022-23 and date of approval = 15 July 2022). Informed assent was taken from participants and parent also gave their consents for participating in the study.

III. DATA COLLECTION

A researcher approached schools in Bangalore, seeking approval and suggestions from school authorities. Upon receiving consent and recommendations, 100 participants were selected from 8th and 9th standards. The participants were informed about the research study and its significance for adolescents. Informed consent was obtained from one parent by providing a copy of the study objectives and the nature of the research, which was facilitated by the school itself.

Data were collected using a tool developed by the researcher, which encompassed sociodemographic details, Internet Use Profile, and a Structured Questionnaire on Cyber Security Awareness. Fifty students from 8th and 9th standards were gathered in a classroom where the researcher explained the study objectives and the necessity for Cyber Security Awareness Training (CSAT) respectively. A pretest was conducted on the same day. The following day, CSAT implementation was carried out separately for girls and boys, in accordance with the school's policy. One week after the CSAT, a post-test was conducted to evaluate its impact.

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Table 1 CSAT Implementation

Sl. No	Sessions	Duration	Content	A.V Aids
1.	1st session	30 minutes	Information about the study and objectives Informed written assent from the students (writtenconsent from parents was already obtained). Pre-test Introduction to Cyber Security.	PPT
2.	2nd session	30 minutes	Information on identifying and safeguarding oneself from cyber risks (supplemented with examples of cybercrime reported in the country and in other countries).	PPT, videos
3.	3rd session	30 minutes	Information on safeguarding oneself from cyber risks andthreats – continued	PPT, videos

Table1. This table depicts Cyber Security Awareness Training (CSAT) implementation which was conducted in three consecutive sessions for 30 minutes each. The post-test was administered 1 week after the last session in order to assess the impact of CSAT.

IV. RESULTS

For data analysis, SPSS Version 28 was employed to analyze the data. The impact of CSAT was evaluated through the Wilcoxon signed rank test. The relationship between baseline variables and the pre-interventional level of awareness was assessed using the Mann Whitney U test and Kruskal Wallis test, with statistical significance set at $p < 0.05$. McNemar's test was utilized to scrutinize changes in the proportion of participants providing correct responses to each item in the questionnaire.

Table 2. Socio-demographic characteristics of the study participants (N=100)

Variables	Category	Percentages (%)
Age (Mean, SD)	13.37 (0.675)	
Gender	Female Male	50% 50%
Standard	8th 9th	54% 46%

Table 2. shows the participants had a mean age of 13.37 years (SD=0.675). A majority of the participants were in the 8th standard, with an equal distribution of 50% male and 50% female participants.

A. Internet use profile

Table 3 Internet Use Profile

Profile	Category	Frequency(%) N=100
Which of the following do you own/use?	a) Mobile b) Laptop c) Desktop d) Tablet e) Multiple	60 (60%) 18 (18%) 2 (2%) 2 (2%) 18 (18%)
Time spent on internet or internet-	a) Less than 60 min/week	27 (27%)

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related services.	b) 1 to 2 hours/week c) 3-5 hours/week d) More than 5 hours/week	47 (47%) 21(21%) 5 (5%)
Platforms you used.	a) Google/You Tube b) Facebook c) WhatsApp d) Instagram e) Multiple	6 (6%) 1 (1%) 15 (15%) 12 (12%) 66 (66%)
Platforms used the most?	a) Google/You tube b) Facebook c) WhatsApp d) Instagram	22 (22%) 4 (4%) 45 (45%) 29 (29%)
For what purpose do you use internet-related services?	a) Entertainment b) Study related c) Social media d) Multiple	12 (12%) 16 (16%) 18 (18%) 54 (54%)
Ever heard of cybercrime-related news/incidents?	a) No b) Yes	22 (22%) 78 (78%)
If yes for Q6, Specify source (n=78)	a) TV, News b) Internet c) Government websites d) Personal experience e) Multiple	43 (54.4 %) 15 (19.0%) 3 (3.8%) 4 (5.1%) 13 (16.5%)
Which according to you is the best approach to protect computer from virus and threats.	a) Use antivirus b) Avoid using pen-drives, external hard-disks, memory card from unknown sources/persons c) Avoid using Wi-Fi from public platforms d) All	13 (13%) 19 (19%) 18 (18%) 50 (50%)
Have you ever experienced any of the following situations? (n=71)	a) Problems from online use b) Received unidentified email or message c) Accidently encountering material that promotes hatred on different religion & child/adult involved in sexual acts online d) Someone else using your IDs without your knowledge e) Multiple	6 (8.5 %) 30 (42.3%) 4 (5.6%) 13 (18.3%) 18 (25.4%)
If you experienced any from above, have you informed anybody? (n=71)	a) No b) Yes – *Parents/Siblings* – *Cousin/Friend*	24 (40%) 47 (47%) *22(46.8%)* *19 (40.4%)*

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Table 3 represents that More than half (60%) of the participants use or own a mobile phone and surf the internet for 1-2 hours per week. The majority use multiple platforms (66%), with WhatsApp being the most commonly used platform (45%). The purposes for using these platforms are varied. Out of 100 students, 78% have heard about cybercrimes, with half of them (54.4%) learning about it from TV and news sources. Half of the participants (50%) are aware of the best ways to protect their computers from viruses. Among the 71 participants who have experienced cybercrime-related incidents, 42.3% reported receiving unidentified messages and emails. Only 46.8% of them reported these incidents to their parents or siblings. (Table 3)

B. Impact of CSAT on cybersecurity level of awareness among adolescents/students

Table 4. Comparison of Pretest and post-test level of awareness regarding cybersecurity among the high school students
*Statistically significant

The analysis unveiled a statistically significant improvement ($p<0.001$) in the awareness level regarding cybersecurity, as indicated by CSAT. (Table 4 &5)

Table 5. Itemwise pre-test and post-test scores

Sl.no.	Questions	Pre-test N (%)	Post-test N (%)	McNemar's value, p
1.	Cybercrime	53%	95%	<0.001*
2.	Phishing	28%	95%	<0.001*
3.	Cyber Grooming	23%	99%	<0.001*
4.	National Cybercrime helpline number	8%	100%	<0.001*
5.	Cybercrime helpline in Karnataka	22%	99%	<0.001*
6.	National Women helpline number	21%	100%	<0.001*
7.	Cybercrime Awareness Month	15%	100%	<0.001*
8.	**Safe or unsafe**			
i)	Accepting friend request from unknown person to know them more or expand connections	99 %	99%	1.00
ii)	Accepting follow request in Instagram/twitter from unknown person online to know more people around	92 %	99%	0.001*
iii)	Meeting up with someone about my age in private/alone, whom I only know online.	86%	100%	0.003
iv)	Meeting up with an adult, I only know online	68%	97%	<0.001*
v)	Sharing a personal picture of my friend to other online friends to make him/her popular in the group.	86%	100%	0.002
vi)	Using pictures or videos against another person	84%	100%	0.002
vii)	Trying to access someone else's device or social media accounts	82%	99%	<0.001*
viii)	Posting funny or negative comments on another person's picture	88%	100%	<0.001*
ix)	Unknown or unpopular apps/software asking to log in with personal details	82%	97%	0.001*

Variable	CSAT Score Median (Q1, Q3)	Z	p-value
Pre-test total	17 (15, 18)	-8.699	<0.001*
Post-test total	24 (24, 25)		

x)	Opening link received from any source in email/WhatsApp/Instagram/Snapchat	75%	100%	0.001*
xi)	Downloading free games or apps or files document from internet unknown source	84%	97%	0.004*
xii)	Trying to contact person online who has good knowledge of internet	49%	70%	0.003*
xiii)	Opening links/sites that are available free from any sources	70%	100%	0.001*
xiv)	Utilizing free Wi-Fi services available nearby from other sources	76%	99%	<0.001*
xv)	Changing profile passwords at least once in a year	79%	91%	0.029*
xvi)	Entering personal details on some links for claiming reward money	97%	100%	0.005

*Statistically significant

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V. DISCUSSION

The present study was attempted to assess the impact of CSAT on level of awareness among high school students at a selected school in Bangalore. The researcher has compared and contrasted the present study findings with the earlier studies in a similar context.

The hypothesis was rejected that "There will be no statistically significant change in awareness on Cyber Security among high school students after the CSAT at $p < 0.05$ level." The CSAT significantly elevated awareness levels about cybersecurity among high school students, with a substantial shift observed in pre-interventional awareness levels post-CSAT ($p < 0.001$). Similar result was found in a mixed-method study conducted by Rahim NH et al (2019) in Malaysia focusing on enhancing a cybersecurity awareness program for personal data protection among youngsters. They found that participant knowledge and skills improved significantly after attending the cybersecurity awareness program ($p < 0.05$) [10]. Same results obtained by Amo L.C et al (2018). An interventional longitudinal study that delivered cybersecurity education through two different time-based approaches to middle school students in California, revealing positive gains in cybersecurity awareness [15]. Roberto A J et al (2014) found similar results by conducting a post-test-only study to assess the outcomes of a School-Based Cyber Safety Promotion and Cyberbullying Prevention Intervention for middle school students and the results indicated the effectiveness of the Arizona Attorney General's Social Networking Safety and Prevention program in producing small yet theoretically important changes in the experimental group [11].

Witsenboer JWA et al (2022) carried out a study measuring the cybersecurity behavior of elementary and high school students in the Netherlands, where an equal number (50%) of male and female high school students participated [16]. Similar study was conducted by Rafiq I (2020) where he has explored cybercrime awareness among male and female adolescents, recruiting 50% females and 50% males. The study concluded that male adolescents exhibited a higher level of awareness regarding cybercrime than their female counterparts [12]. This current study, researcher has recruited equal numbers (50%) of male and females high school students and found that there is no significant difference in level of awareness between male and female high school students.

This study included high school students, with 54 studying in 8th standard and 46 in 9th standard. Similarly, Roberto A J et al (2014) assessed the outcome results of a School-Based Cyber Safety Promotion and Cyberbullying Prevention Intervention, encompassing 6th grade (n=133), 7th grade (n=156), and 8th grade (n=151) [11].

This study found that more than half (60%) participants own/use mobile phones. Similar results found by Lam L T et al (2014) a survey being conducted for investigating the relationship between problematic internet use by parents and adolescents, they discovered that 89.4% of adolescents possessed smartphones with internet access [17]. In the current study, over half of the participants (54%) reported using the internet for entertainment, study, and social media. Kwaku B A et al (2018) conducted a study assessing students' awareness of internet usage and cybercrime in high school, finding that the majority of respondents (71.3%) used the internet for 2-4 hours per day [13]. Moaneke PB et al (2018) conducted a study assessing ICT use and misuse by adolescents, revealing that the majority engaged in watching movies/videos, playing games, social media, school work, reading news, and sending/receiving messages through the internet [18]. Meena Y et al (2020) conducted a cybercrime youth awareness survey in Delhi, identifying the internet (78.8%), newspapers (49%), television (47.7%), and family members (22.5%) as primary sources of cybercrime awareness. In the present study, 22% of participants reported sharing their online experiences with parents/siblings, and 19% with cousins/friends [14]. Moaneke PB et al (2018) found that the majority of females discussed their online experiences with their mother, sister, and friends (52%) [18]. Martis P et al (2018) assessed cybercrime awareness among youth, revealing a lack of awareness regarding phishing, cyberstalking, and protection measures for personal computers and laptops [19].

The study found that the Cyber Security Awareness Training (CSAT) significantly increased awareness about cybersecurity among high school students, with a notable improvement observed from pre-interventional levels ($p < 0.001$). The study included an equal number of male and female students, with no significant difference in awareness levels between genders. Over half of the participants used mobile phones and reported using the internet for entertainment, study, and social media. The findings align with other studies that also reported significant improvements in cybersecurity awareness following educational interventions. Additionally, the study highlighted that primary source of cybercrime awareness among participants included the internet, newspapers, television, and family members.

VI. STRENGTHS

In India, there is a lack of available literature regarding educational resources on cybersecurity measures aimed at protecting adolescents from cyber risks and threats. The present study was carried out by a nurse to demonstrate the impact of Cyber Security Awareness Training (CSAT) on the level of awareness among high school students.

VII. LIMITATIONS

The chosen design for the study is a single-group pre and post-test design, lacking a control group, thereby limiting its generalizability. Additionally, the study's small sample size poses a constraint on its overall generalizability.

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VIII. CONCLUSION

The study findings support that the CSAT was significantly effective in improving the level of awareness regarding cybersecurity among high school students. The study has significant implications in nursing education, practice, administration, and research. Furthermore, it is recommended to conduct more interventional studies involving both adolescents and adults. There should be an emphasis on providing educational materials and introducing cybersecurity education at the school level.

- *Conflict of Interest*

There was no conflict of interest during the study conducted from any side.

RECOMMENDATIONS

There is a lack of published Indian literature on interventional or training programs in this area. There is a need for increased awareness among stakeholders. Future research should include interventional studies with larger sample sizes and program-based studies.

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