



## THE ROLE AND CHALLENGES OF WOMEN IN CYBERSECURITY IN NAGAPATTINAM DISTRICT, TAMILNADU, INDIA.

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### Abstract

Around quarter of cybersecurity occupations overall are held by women, which unfortunately doesn't exactly match the half of worldwide female populace. Despite the fact that there has been progress throughout the course of recent years, more work should be finished. Women face numerous impediments in the field of cybersecurity, including a shortage of mentors, deficient media portrayal, and an absence of industry good examples. Quick advancements in innovation, especially in the field of cyberspace, have introduced another time of information, opportunity, and development<sup>4</sup>. Be that as it may, the web's quickly extending come to, the speedy scattering of data through cell phones, and the expanded utilization of virtual entertainment have likewise prompted an ascent in wrongdoing. In this specific circumstance, women's weaknesses in reality are reflected in the virtual world and are periodically exacerbated by its speedy and boundless scattering, anonymized utilize potential, and low client mindfulness. It's a given that a worldwide issue in cybersecurity is the absence of gender variety in the field. While there are different justifications for why women are still underrepresented in this field, significant bias and gender generalizations add to the discernment that a profession in cybersecurity is unsatisfactory for women. Fortinet is among the many organizations that are effectively resolving this issue<sup>9</sup>. This reaches out past believing variety to be an honorable goal, which it is. Taking into account the developing emergency brought about by the worldwide security abilities hole, it is basic that more women join the positions of cybersecurity experts assuming our general public is to be safeguarded. Research demonstrates that women are underrepresented in the cybersecurity field, albeit this is slowly evolving. The new development offers women who are simply beginning their vocations an upper hand in the gig market. Hence, the present study has been done to highlight the role and challenges of women in cybersecurity in Nagapattinam District.

**Keywords:** Gender Diversity, Technology Changes, Global Security, Virtual Vulnerabilities, Skills Gap, User Awareness and Skill Training.

### INTRODUCTION

Regardless of the headway made, women in cybersecurity actually face special difficulties. The gender hole, oblivious predisposition, and working environment culture issues

can deter women from seeking after or progressing in cybersecurity vocations. The realities that cybersecurity is as yet a male-overwhelmed industry and women have generally been deterred from seeking after vocations in fact requesting fields can make a threatening environment for yearning female experts. Moreover, restricted mentorship potential open doors, gender based separation, and an absence of portrayal in administrative roles further compound the difficulties looked by women in this industry<sup>1</sup>. These variables add to the underrepresentation of women in cybersecurity, sustaining the gender hole. Engaging women is significant for cybersecurity organizations and a world in which cybersecurity is key for all of society. The underrepresentation of women in cybersecurity in no way, shape or form comes from an absence of open positions the tech business is enormously short-staffed, and worker maintenance is at an unequaled low. Perceiving the requirement for variety and inclusivity, an ever increasing number of organizations are having a go at implementing drives to enable and uphold women in cybersecurity<sup>3</sup>. As the world turns out to be progressively dependent on advanced framework, the requirement for different points of view in cybersecurity has never been more basic. Women are breaking generalizations, conquering difficulties, and taking critical steps in this industry however there is something else to be finished<sup>10</sup>. Assuming organizations mean to draw in and hold women, they should keep on attempting to help women-accommodating approaches and culture, and to recognize and lessen underlying disparities in recruiting, assessment, advancement, and prizes requires something beyond individual endeavors<sup>2</sup>. The current review has been determined to give a logical framework on the role and challenges of women in cybersecurity in Nagapattinam District.

## RESEARCH OBJECTIVES

The present study aimed with following objectives:

1. To study about women and cybersecurity.
2. To concise the theoretical view in role and challenges of women in cybersecurity.
3. To analyze various factors associated with study to draw matching conclusion for the study.

## REVIEWS OF RELATED LITERATURE

**Egete, D. et al.<sup>8</sup> (2023)** have explored from their study as women and ethnic minorities have generally been underrepresented in the cybersecurity business. Issues that influence both Africa and the worldwide support of women and ethnic minorities in cyber-security incorporate deficient portrayal and mindfulness as well as maintenance issues. Further, issues, for example, harassment, gender predisposition and the possibility that cybersecurity is a "man's reality" are likewise contributing elements<sup>11</sup>. This paper gives a system to examining a portion of the abilities that are accessible to women and underrepresented gatherings and contends for the need to tackle this issue. Programs endeavoring to build the cooperation of women and ethnic minorities in cybersecurity are talked about. Finally, a few ideas to remediate this inescapable issue are likewise given.

Ajgar, Amey & Ajgar, Yogita.<sup>1</sup> (2022) have extracted from their study demonstrating metaverse is the eventual fate of the web. The impending many years will be controlled by Metaverse and before this innovation turns into a need for us, it's similarly essential to make it ok for all sections of society including women. In the realm of virtual entertainment where women become an obvious objective of cyber harassing, advanced cheats and numerous other computerized issues, we can't deny the way that Metaverse is multiple times more vivid and this expands the danger of cybersecurity something else for women. In web 3.0 women have confronted basic security issues and it's important to further develop Metaverse and make it a more secure innovation for women.

S, Kavitha.<sup>16</sup> (2021) have summarized their study as the quantity of web clients in India is expanding. Web world is setting out colossal open doors for women to voice out their viewpoint unafraid in the cyber space. It has made more advantages regarding access and open doors. With the quickly developing reach of the web, expedient spread of versatile data and the raised utilization of virtual entertainment, violations are additionally expanding. Women being a weak gathering frequently succumb to this. There are numerous security devices and spaces accessible where women can partake in the advantages of the cyber world. Yet, absence of mindfulness on the most proficient method to utilize things securely and securely is making women more helpless against cyber-assaults than men<sup>13</sup>. This exploration study was an endeavor to comprehend how much women clients know about dangers in cyber-space; safety measures to be taken and legitimate security accessible to them.

## WOMEN AND CYBERSECURITY

Cybersecurity is a male overwhelmed industry, with a few reasons being narratively used to make sense of this phenomenon. A great many cybersecurity experts all over the planet are on the bleeding edges of following and tending to computerized gambles and online dangers. The tech and cybersecurity businesses are among the most sought after, beneficial, and basic fields in present day history. However, nations all over the planet are confronting a deficiency of learned and experienced cybersecurity ability that can stay up with the quick pace of digitization and the equal multiplication of computerized chances. Specifically, women represent just 2 out of 10 cybersecurity experts, regardless of addressing close to half of the worldwide labor force. This hole can be made sense of by a few elements, including industry discernment and culture, cultural and family limitations, hindrances to passage because of restricted computerized and cyber proficiency, wage holes, lower procuring potential at each level, missed or deferred advancements, and a lot harder way to arrive at the more elite classes of the corporate world in spite of frequently having more significant levels of schooling and confirmation than men<sup>12</sup>. The under-portrayal and under-usage of female ability is both a basic business issue and an impediment to the development of more secure and strong economies and social orders, as well as the general security and insurance of nations. As well as deteriorating the deficiency of cybersecurity experts when they are sought after, this hole further exasperates gender inconsistencies across other sectors. Moreover, female web clients as of now face a larger number of cybercrime occurrences and online harassment while likewise being at an expanded gamble of monetary information misfortune, infringement of

protection, and security breaks. Together, these elements highlight the significance of planning a cyberspace that is more secure, more gender comprehensive, and elevates the endeavors to close the labor force and Gender gap<sup>14</sup>.

There is an overall deficiency of staffing with regards to the business of cybersecurity. In any case, women address just 20% of the labor force in cybersecurity. There is an extreme deficit of ability from one perspective. However, on the other, including more women likewise adds to the gender equilibrium and variety of the labor force included. Counting more women in the labor force works on the variety, points of view, authority and experience of the labor force and this effects the business. While this is valid for any job in the organization, it is especially applicable in the cybersecurity space. Programmers and individuals who present dangers accompany a wide assortment of foundations and in this manner we want individuals with divergent and various foundations to manage these dangers so the possibilities of our prosperity are better<sup>16</sup>. Taking into account the different continuous industry challenges emotional gender lopsidedness and the rising ability hole a few once in a lifetime kinds of chances for women to move gradually up to huge influential positions are opening up. Cybersecurity is a huge industry that needs experts for various essential capabilities, like security tasks, consistence, occurrence dealing with, examinations, inspecting, preparing, and a few others. As a lady, they have the decision to browse many such positions.

## **THEORETICAL PERSPECTIVE IN ROLE AND CHALLENGES OF WOMEN IN CYBERSECURITY**

Cybersecurity requires human association and correspondence at the organizational level. Utilizing the right specialized instruments is surely significant, yet individuals from an organization likewise should be prepared on the most proficient method to utilize them. Cybersecurity experts need to exhort on functional security best practices, like areas of strength for utilizing and keeping up with actual security around network passages, to safeguard against the full range of dangers. Programming might have the option to stop an infection, yet just prepared and informed people can make preparations for, for instance, a phishing trick that could permit an unapproved client to take passwords and get close enough to delicate information. Additionally, cyberattacks develop more changed continuously, and individuals making them come from different, worldwide foundations<sup>17</sup>. Thusly, cybersecurity experts should expect the following assault and proactively make a reaction, utilizing the instruments and conventions accessible to meet the singular security need. Implementing a fruitful cybersecurity plan requires imaginative, adaptable, vital reasoning to address the different cluster of elements that influence security and move toward them in a way that works for an organization's one of a kind conditions<sup>8</sup>.

There are huge boundaries for women attempting to get everything rolling in cybersecurity, yet there are ways for decided women to get through those obstructions. Those generally in the functioning scene might find inside open doors at their ongoing businesses as

they perceive the requirement for cybersecurity. Everybody attempting to get a beginning in the business can profit from contacting a similar mentor. There is esteem, as well, in assurance and readiness to face challenges. It's just fitting that such a quick moving, cutthroat field compensates the striking. The cybersecurity gender hole perseveres<sup>18</sup>. Couple this with the coming of an abilities lack, and the business has two major issues on hands past the consistent work is danger hunting and relief<sup>15</sup>. Organizations should put resources into long haul social changes. The dangers that an organization faces needs an all-active the-deck approach. The weaknesses in our frameworks are driving cyber hoodlums to concoct different new strategies. To deal with them, we want the best of individuals and women can make a positive effect in this field<sup>7</sup>. Women likewise bring a capacity of having the option to consider out the crate and these can be extremely helpful to deal with a few dangers particularly web security. Women likewise bring alternate points of view which can prompt better business choices and hearty security conventions. Women are additionally equipped for filling different work jobs and offering esteem.

### ANALYSIS AND INTERPRETATIONS OF MAJOR FINDINGS

Following are the results of major analysis done from the randomly selected 150 women respondents from Nagapattinam District.

**Table 1: Socio-Demographic Profile of the Respondents (150 respondents in Total)**

Basic	Variables	Frequency of Respondents	Percent
Age	Below 30 years	75	50.00
	31 – 45 years	57	38.00
	Above 45 years	18	12.00
	Total	150	100.00
Marital Status	Married	118	78.70
	Unmarried	32	21.30
	Total	150	100.00
Education Qualification	Illiterate	27	18.00
	Up to HSC	37	24.70
	Under Graduation	51	34.00
	Post Graduation	28	18.70
	Others	7	4.70

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	Total	150	100.00
Occupation	Government Employee	28	18.70
	Private Employee	73	48.70
	Business/SHG	23	15.30
	Unemployed	26	17.30
	Total	150	100.00
Family Income (M)	Below Rs. 20,000	25	16.70
	Rs. 20,001 – Rs.40,000	81	54.00
	Rs. 40,001 – Rs.60,000	22	14.70
	Above Rs. 60,000	22	14.70
	Total	150	100.00
Residential Location	Urban	42	28.00
	Semi-urban	81	54.00
	Rural	27	18.00
	Total	150	100.00

**Source:** Primary data

It is extracted from above table, out of 150 women respondents the majority of the respondents i.e. 50 per cent of the respondents are belongs to below 30 years age category, 78.70 per cent of the respondents are married. And maximum of the respondents (34 per cent) are under graduated, 48.70 per cent of the respondents are private employees. The majority i.e. 54 per cent of the respondents are falls under the family income category Rs. 20,001 – Rs. 40,000 monthly. And 54 percent of the respondents are from semi-urban area.

**Table 2: Cross-Table Analysis on Socio-Demographic Variables of the Respondents and Challenging Factors of Cybersecurity among Women**

*(AS – Lack of Abilities & Skills; EA – Lack of Exposure and Awareness; SS – Lack of Societal Support; GD – Gender Discrimination and CB – Lack of Cultural Background)*

Basic	Variables	Factors					Total
		AS	EA	SS	GD	CB	

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Age	Below 30 years	15	<b>29</b>	8	14	9	75
	31 – 45 years	17	<b>20</b>	6	10	4	57
	Above 45 years	1	7	2	6	2	18
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>
Marital Status	Married	27	<b>37</b>	13	26	15	118
	Unmarried	6	<b>19</b>	3	4	0	32
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>
Educational Qualification	Illiterate	7	<b>10</b>	1	5	4	27
	Up to HSC	9	<b>17</b>	4	2	5	37
	Under Graduation	10	<b>22</b>	4	12	3	51
	Post Graduation	6	4	7	<b>10</b>	1	28
	Others	1	3	0	1	2	7
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>
Occupation	Government Employee	5	<b>13</b>	5	4	1	28
	Private Employee	19	<b>20</b>	8	18	8	73
	Business/SHG	2	<b>13</b>	0	6	2	23
	Unemployed	7	<b>10</b>	3	2	4	26
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>
Family Income (M)	Below Rs. 20,000	3	<b>10</b>	3	5	4	25
	Rs. 20,001 – Rs.40,000	16	<b>28</b>	11	19	7	81
	Rs. 40,001 – Rs.60,000	7	<b>10</b>	0	2	3	22
	Above Rs. 60,000	7	<b>8</b>	2	4	1	22
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>
Residential Location	Urban	9	<b>15</b>	5	7	6	42
	Semi-urban	20	<b>31</b>	7	20	3	81

	Rural	4	10	4	3	6	27
	<b>Total</b>	<b>33</b>	<b>56</b>	<b>16</b>	<b>30</b>	<b>15</b>	<b>150</b>

**Source:** Primary data

It explored from the table 2, the majority of the respondents are affecting by *lack of exposure and awareness* on cybersecurity except for the respondents who are majorities in post-graduation is affected due to gender discriminations.

### **Hypothesis**

**Null Hypothesis (H<sub>00</sub>)** – There is no significant relationship between socio-demographic factors and challenging factors of cybersecurity among women.

**Alternative Hypothesis (H<sub>01</sub>)** - There is significant relationship between socio-demographic factors and challenging factors of cybersecurity among women.

**Table 3: Chi-Square Analysis on Socio-Demographic Factors and Challenging Factors of Cybersecurity among Women**

Socio-Demographic Variables → Challenging Factors	LoS @5%	p-value	Result
Age → Challenging Factors	0.05	0.566	NS
Marital Status → Challenging Factors	0.05	0.029	S
Educational Qualification → Challenging Factors	0.05	0.042	S
Occupation → Challenging Factors	0.05	0.142	NS
Family Income (M) → Challenging Factors	0.05	0.549	NS
Residential Location → Challenging Factors	0.05	0.153	NS

**Source:** Primary data (Challenging Factors – *Lack of Abilities & Skills; Lack of Exposure & Awareness; Lack of Societal Support; Gender Discrimination and Lack of Cultural Background*)

It is found from table 3, there is significant relationship between marital status and educational qualification of the respondents and challenging factors of cybersecurity among women and there is no significant relationship between age, occupation, family income and residential location of the respondents and challenging factors of cybersecurity among women.

**Table 4: Analysis on Perception of Respondents on Present Status of Cybersecurity for Women under various Dimensions**

Dimensions	SA	A	N	DA	SDA	Mean	S.D.

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Lack of good examples for women in online protection; absence of female pioneers in cyber safety	51	49	13	30	7	2.29	1.255
Absence of mindfulness on vocation valuable open doors in cyber safety	45	48	37	14	6	2.41	1.259
Bunch variety encourages inventiveness, development, and execution	54	50	27	11	8	2.23	1.261
By and large, women have significantly added to figuring science and innovation, however their commitments are not really recognized	60	45	31	10	4	2.16	1.232
Contrasts in administration styles: groundbreaking, comprehensive, and participative value-based	44	55	30	15	6	2.33	1.207
Female experts will generally overcompensate for schooling yet undercompensate for building solid expert organizations, fundamental in online protection	42	62	26	12	8	2.31	1.204
HR and showcasing materials for cyber safety work positions are not planned in that frame of mind for women	45	64	19	16	6	2.18	1.118
In their vocations, women depend more on women based cyber, which are restricted in cyber safety	33	65	28	15	9	2.43	1.195
Online protection contests used to draw in graduates to online protection are custom fitted for men	44	66	22	11	7	2.21	1.156
Male digital experts know nothing about difficulties experienced by women; more women are expected to increment mindfulness	51	60	21	13	5	2.13	1.131
Normal types of segregation: oblivious predisposition, unexplained defers in profession advancements, posturing, fault culture, unmistakable separation	47	52	33	10	8	2.35	1.275
Online protection advances male in-overall vibes, critical thinking approaches, and values	75	35	22	13	5	2.25	1.074

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Inadequate fascination, employing, and maintenance rehearses for women in cyber protection	40	53	35	11	11	<b>2.49</b>	<b>1.304</b>
Organizations approach gender variety as fat channels or consistent lines	40	56	32	12	10	2.44	1.272
Social ways of behaving and social insights 'occupations for men' and 'occupations for women'	48	51	28	12	11	2.35	1.301
Women are expected to address deficiency of digital experts	62	46	22	12	8	2.12	1.247
Women are ideal objectives for digital wrongdoing and may cultivate a seriously sustaining and sympathetic way to deal with this profession	41	5	28	15	9	2.38	1.235
Women for the most part go with their vocation decisions between the ages of 15 and 21, when there is a fundamental absence of advancement for professions for women	46	59	24	12	9	2.27	1.226
Women will generally be more taught than men and have complementary abilities that apply well to cyber protection (for example correspondence, instructing, critical thinking, compassion)	39	61	28	15	7	2.35	1.188
Wording in cyber protection repulses women	41	65	20	16	8	2.26	1.155

Source: Primary data (*SA – Strongly Agree; A – Agree; N – Neutral; DA – Disagree and SDA – Strongly Disagree*)

It is explored from table 4, for all the statements asked related to present status of cybersecurity for women under various dimensions the maximum of the respondents have opined 'strongly agree' and 'agree'. And the statement 'inadequate fascination, employing, and maintenance rehearses for women in network protection' have secured top mean score which indicated the fascination, employment and maintenance for women is in sufficient.

**Table 5: Weighted Average Analysis on Various Suggestions recommended for Challenges faced by Women in Cybersecurity**

Recommended Suggestions	Weighted Score	Average Score	Ranks
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In the workplace, women help one another out	1253	8.35	XII
Male advocacy in the industry, at home, and at work	2015	13.43	IV
Women's education, upskilling, and self-learning	1754	11.69	VII
Women in the industry networking on their own	1678	11.19	IX
Collaborations between industries to increase awareness of women in cybersecurity	1974	13.16	V
Leadership development is one of the compliance programmes for diversity, inclusion, and equity within organisations	1008	6.72	IX
Programmes that mentor women	1325	8.83	XI
Programmes for women's development and training	1624	10.83	X
Advertisements promoting the employment of women in cybersecurity	1003	6.69	XV
Focused investigation on women in cybersecurity, encompassing data collection and dissemination on women in cybersecurity metrics	2179	14.53	II
Organisations should implement flexible work schedules	2200	14.67	I
Development of technical and non-technical cybersecurity skills in university programmes	1742	11.61	VIII
Expansion of the industry and the creation of jobs, particularly the growth of entry-level positions	1179	7.86	XIII
Government regulations development and assistance to address the main issues that women in the workforce face	1897	12.65	VI
Redefining cybersecurity as a concept and a sector	2075	13.83	III

**Source:** Primary data

It is clear from above table 5, the maximum respondents given first rank for recommended suggestion 'organizations should implement flexible work schedules' and the suggestion 'focused investigation on women in cybersecurity, encompassing data collection and dissemination on women in cybersecurity metrics' secured second rank and the suggestion 'Advertisements promoting the employment of women in cybersecurity' secured last i.e. fifteenth rank.

## DISCUSSION AND CONCLUSION

It is all around perceived that women are under-addressed in the cybersecurity world. This underrepresentation influences the capacity of organisations and establishments in the business to draw on variety of thought, abilities, and encounters and, to put it plainly, be creative. Under-portrayal is the most obvious side effect of the difficulties that women face while entering, or staying, in the business. While the effects of underrepresentation are somewhat very much recognized, it is the reasons for the under-portrayal which should be perceived, further investigated, and at last, settled. It is recommended that the controlling the metaverse space with severe guidelines to counter women related security dangers<sup>6</sup>. Making women exceptional with essential information to work metaverse in a more secure manner. Women shouldn't impart their own information to tech organizations to stay away from any sort of future perils. Confirmation in light of IP locations ought to be utilized in metaverse to make it more straightforward to figure out associates in any sort with criminal operations that happen in metaverse. Some passage hindrances ought to be presented by metaverse stages. These section boundaries ought to limit counterfeit records; bot worked symbols, to protect computerized security of clients. Experimental modes ought to be empowered in the metaverse for women so that women can investigate the metaverse with practically no concerns. Utilization of harmful words and improper signals performed by symbols ought to be confined. Clients should have a choice to obstruct or to confine specific symbols from entering their metaverse space. Client ought to select eye safe AR and VR headsets. Fair and safe utilization of Metaverse ought to be guaranteed.

A user of a gadget genuinely should initially realize it well and afterward use it. In the radiance of a similar mindfulness with respect to the various sorts of cybercrimes is vital for women and young ladies. Indeed, even female kids beginning from the schools ought to be made mindful of the cybercrimes in light of the fact that after the flare-up of the Coronavirus pandemic even the youngsters had online classes and they also are very knowledgeable with these advancements and it's exceptionally simple to bamboozle girls for passwords, suicides through games, child porn, and so on<sup>20</sup>. Women were at that point being exposed to numerous gender explicit wrongdoings since an extensive stretch of time and presently notwithstanding that they are being survivors of these new age cybercrimes as well. The most serious issue with cybercrimes is that it's far much harder to handle than regular violations since this goes past the lines of the states and countries<sup>5</sup>. Additionally every single one has some or the other electronic gadgets. It is more direct for guilty parties to perpetrate cybercrimes in any event, being miles from the person in question. All things considered mindfulness among females and women is likewise vital in order to not to cause themselves to contribute towards turning into a victim. There is an extreme absence of mindfulness among women about the cyber regulations and what to do facilitate when an individual turns into a casualty of cybercrime. This prompts mental desolation and has numerous multiple times prompted self-destruction endeavors by victim as well<sup>19</sup>. In this way, familiarity with cyber regulations is vital for women not simply to try not to turn into a survivor of such cybercrimes yet additionally detailing of cybercrimes. Another vital dimension is even today the methodology subsequent to

documenting up of a cybercrime follows the extremely customary techniques for examination. Further developing cybersecurity by the Government and other approved organizations and establishments is the need of great importance. Cyber watching, mindfulness, preparing and limit working of examiners can help in bending the menace of cybercrimes.

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