

Women's Mental Health Prediction and Empowerment in COVID-19

Aditya Maurya¹, Pranita Waghmare², Prof. Sonali Patil³

^{1,2}Student, Dept. of Computer Engineering, M.G.M College of Engineering and Technology, Kamothe, Maharashtra, India.

³Professor, Dept. Of Computer Engineering, M.G.M College of Engineering and Technology, Kamothe, Maharashtra, India.

Abstract - The current global epidemic of COVID-19 has changed the modus operandi of all segments of society. While a few pandemic-related stressors affect almost everybody, they mainly affect women. The need for developing an assistive system for women has increased with the exponential rise in women's mental illness worldwide. The method presented in the paper uses machine learning in real-time to predict the mental state of women, and then based on those learnings, the Artificial Intelligence module integration assists them with various friendly solutions to focus on their mental health and overcome simultaneously.

Key Words: COVID-19, mental health, machine learning, naïve bayes classifier, real-time, artificial intelligence.

1. INTRODUCTION

1.1 Background

The COVID-19 pandemic has already established prejudiced impacts on every component of society but missing mental health threats. The lockdown imposed by the government in different countries has taken a toll on people's mental health and mainly on women. Undoubtedly, during these unprecedented times, the likelihood of rising mental health issues is high. Some studies show that the pre-existing gender gap in mental health, with women worse affected than men, has broadened critically during a pandemic. The World Health Organization (WHO) declared COVID-19 a pandemic since March 2020 and due to the value of human-to-human transmission, social distancing and lock-down are the control plans embraced by most countries on earth. The prime minister of India has declared a three-week nationwide lockdown starting from midnight the 25th of March 2020 to the 14th of April 2020, explaining that it was an essential and effective measure for breaking the COVID-19 infection cycle.

Social distancing is a necessary means to break the cycle of infection. This decision caused a significant change in the everyday life of Indians: travel or movement restriction, suspension of work and studies, prolonged and forced contact between family members, reduced means of entertainment, boredom, loss of contact with wider social circles, and economic difficulties. These

factors may have resulted in the COVID-19 pandemic turning into a psychosocial catastrophe and also a primary physical wellness dilemma.

1.2 Why Gender-Specific?

Gender can be a vital determinant of emotional health and emotional disease. The routines of emotional distress and psychiatric illness among women will vary from those found among men. Girls have a high mean degree of thyroid disorders, whereas men reveal a high mean number of externalizing disorders. Gender differences occur mainly in the rates of common mental disorders wherein women predominate.

Differences between sexes are reported at age of onset of symptoms, clinical attributes, frequency of symptoms, class, social adjustment, along also a long-term effect of acute mental disorders. Gender differences occur mainly in the rates of common mental disorders - depression, anxiety, and somatic complaints. In which women predominate, these disorders affect approximately 1 in 3 people in the community and constitute a serious public health problem. Depression isn't simply the most frequent women's emotional medical condition but might be persistent in older younger women than men. Women are suffering the deadly effect of lock-downs and also quarantines. For the sturdy, hearty, and dutiful Indian housewife, forever confined to her boxed household, it was always a lockdown. From running domestic chores, rearing and nourishing her children, tending to the elderly, looking after her husband, to repeating this quotidian cycle perpetually, she has always lived in a lockdown. The most horrific and noticeable impact of the lockdown imposed on females has been a rise in domestic and intimate partner violence as has been noted. A rise in domestic violence increases the risk to women's lives: as one curve gets flattened, the other one slopes upwards, perhaps not exponentially, but sharply, nevertheless, the accounts are painful to read. Frustrated partners are battering women, are also being threatened to be kicked out of the house if they feel sick. It might seem that lockdown has not affected the lives of housewife's, which is somewhat correct, but the number of chores and pressure has increased as the family members are all the time at home and never-ending demands of those family members.

1.3 What Can Be Done?

Our study aims to address some of the necessary information regarding mental health challenges and the potential quick fixes. The outline shall help women take a self-assessment that will include some questions regarding Mental health problems related to their day-to-day chores and predict whether they are stressed, mentally unhealthy, or fine.

Further, there will be suggestions provided for home remedies or if higher risks then, contact with Doctors. This project will provide an empowerment opportunity by giving them job availability or to start their own business or create a community based on their core abilities. This will be an excellent help for tired and stressed women by giving them a platform to showcase their talent, communicate with people around them, and raise their families by earning during such lockdown situations.

2. LITERATURE SURVEY

Gender was described as being a crucial determinant of emotional health and emotional disease. The Indian culture is exceptional. Joint family, patriarchy, union essential, particularly women; the union is a lifestyle marriage, permanent marriage; subservient status of daughter-in-law's at-home, taste for the male child, the tradition of dowry, lower educational status of women, strict code of behavior for females, along with principal functions of women being child-rearing, and also the "Indian Paradox" (the wed woman with acute mental disease, exposed to domestic violence (DV) makes frenzied attempts for restitution of conjugal rights in the place of such as divorce or separation), are all part of the Indian culture. These factors significantly impact the phenomenon, symptoms, treatment, and outcome of mental disorders in women of India.

Thus, women's mental health can be conceptualized as having a wide range of related areas, including reproductive health, psychopharmacology, psychosocial determinants of mental health, and legal issues. However, traditionally, women's mental health is conceived in terms of reproductive health; other areas have received little attention—the Indian Psychiatric Society was formed on January 07, 1947. The first paper, which particularly focuses on women's health, appeared in 1969 on the causal factors of puerperal psychosis. Women in the younger age group, coming from rural areas and lower or lower middle- class income group, and usually in their first or second para were most prone to develop puerperal psychosis. A thorough manual search of articles published in the Indian Journal of Psychiatry since its inception found two presidential addresses, the first on "Women and mental health" [6] and the other on

"Marriage, mental health and Indian legislation;"[7] one editorial; 9 original papers, 4 case reports, and one oration on "Interface between psychiatry and women's reproductive and sexual health,"[9] that have discussed exclusively women related issues.[1] From 2009 until date, there have been 16 publications on women's mental health: 1 presidential address, 1 book review, 2 editorials, 2 letters to the editor, 4 research papers, and 6 review articles. Of these, 10 (62%) have focused on violence against women. These include the presidential address on "Violence against women: Where are the solutions?" [4] 2 guests' editorials ("Sexual coercion: Time to rise to the challenge" and "Sexual abuse in women with special reference to children: Barriers, boundaries, and beyond"), 3 review articles and 2 research papers, and 2 letters to the editor.

An overview of this research on topics specific to women published chiefly from the Indian Journal of Psychiatry reported that Indian Psychiatrists have functioned in a vast selection of subjects, for example, emotional facets of different reproductive periods: childbirth, puerperium and menopause and menstrual cycle, and emotional consequences of contraception, childbirth and surgical decline of breast or uterus; suicide, and the association between DV and emotional wellness, suicidal behavior, and contraceptive tendencies.[10,11] depression isn't merely the most frequent women's emotional, medical condition but might be persistent in older younger women than women. Most essential may be that the high degrees of depression, anxiety, and somatic symptoms are all directly associated with selecting risk factors like gender-based functions, migraines, unpleasant life experiences, and events. For common psychological ailments, the gender-specific hazard factors which affect women comprised gender-based violence, socioeconomic disadvantage, low cash flow, and income inequality, poor or low social status and status, and unremitting liability for its care of many others. [10,12] and observed that, women tend to be more vulnerable to sexual abuse, contributing to high degrees of posttraumatic stress disorder (PTSD).

2.1 Data Collection

To gauge the impact of the lockdown on employment, Ashwini Deshpande, professor of economics at Ashoka University, looked at national-level panel data from the Centre for Monitoring Indian Economy (CMIE)'s Consumer Pyramids Household Survey (CPHS) database for an argument newspaper released about the University's website. CMIE's database covers 170,000 households, talking with each household three times annually and surveying approximately 11,000 households per week. Deshpande said this was the only available national-level source in the absence of official data on employment since 2017- 18.

The CMIE data showed that job declines in April in the immediate aftermath of the federal lockdown were significant. Employment in April 2020 was only 70% of the average of the previous fiscal year ending March 2020, Deshpande found. Far more men are in the paid workforce in India than women, and women's participation in the paid labor force was in continuous decline. Consequently, the sheer number of men who reported having lost unemployment in April 2020 compared to the average of the preceding year was much larger than the number of girls who reported losing their jobs. Over 100 million guys lost jobs, according to 17 million girls. Nevertheless, in percentage terms, the number of men who reported themselves as employed dropped by 29% between March 2019-20 and April 2020, whereas in the case of girls, the shift was much more significant at 39%. This suggests that even from an already low base, four out of every ten women working during the last year lost their jobs through the lockdown.

More men lost jobs by April 2020, but the impact was proportionately greater on women

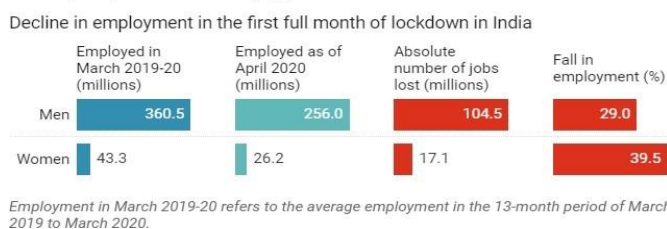
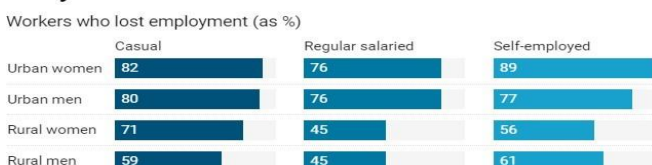


Fig 1: Fall in Employment

Other Indian studies have located a similar disproportionate effect on women. At a poll of 4,000 people across 12 nations, researchers at the Azim Premji University found that two-thirds (67%) of their workers they surveyed reported having lost their occupation. However, the sample wasn't random, with been got by civil society organizations, also had more women than men, while women make less than 20 per cent of the paid workforce in India. In their sample, urban India was more severely affected with 80 per cent of these urban sample reporting job losses according to 57% of their gigantic sample. Around states, the share of women reporting occupation losses was greater than that of men, the investigators found.

In a select sample of workers, women were more likely than men to have lost their livelihoods



Sample used in the survey is purposive and not representative, data unweighted. Employment loss is as of May 2020, relative to February 2020.

Fig 2: Employment loss

The National Legal Services Authority (NALSA, 2020) reported having 727 cases of domestic violence enrolled within a short period of lockdown in India, where the most significant number of cases were from Uttarakhand (144), Haryana (79), and Delhi (63). It is crucial to be aware that over the first week of their national lockdown, the National Commission received 214 complaints for Women (NCW), 58 cases of domestic violence (Bose, 2020).

It is common knowledge that the aforementioned figure undoubtedly does not include the countless unreported circumstances. A gender-wise relative picture about mental health and different afflictions would introduce a better outlook on matters. Going by reports, chemical use led disorder reflected in higher emotional morbidity among men (13.9%) as compared to females (7.5%) (The National Mental Health Survey of 2015-16).

The patient's risk of suicide was detected as 0.9% (having higher risk), 0.7% (with moderate risk category), and the highest in 40-49 years which is more significant among females, especially in urban metros. However, depression and anxiety are the most common mental disorders worldwide when it comes to guys (International Burden of Disease study, 2020). The most current National Sample Survey, " July-December 2018 (NSS 76th round) on economists reported that 59.8 per cent and 56.8% female and male respectively of those surveyed respondents with mental retardation/intellectual disabilities consistently find personal assistance due to their daily pursuits. In terms of figures for those with mental illness who consistently seek private aid for their daily pursuits, these are 38.2 per cent and 34.4 per cent for males and females, respectively.

The most important fact is that women are losing access to vital social support, which is wreaking havoc on women's lives.



Fig 3: Surge in Domestic Violence cases

3. PROPOSED SOLUTION

3.1 Overview of the Mental Health Predictor

To better display a clear picture of the mental health of women, we can develop a Mental Health Prediction app

that uses Machine Learning, integrated into it. This will be based on a self-assessment test taken by the user where the test includes some questions based on the daily curriculum and some mental health-related that will have options that the user will have to select from the listed options.

Here, the impact of ML in developing the mental health behavior model will be strongly mediated by the design of systems that employ ML, which motivates us to examine recent research in computing and HCI addressing this topic. Complementing research perspectives from medical science and clinical psychology, our article presents a systematic review of the ACM Guide to Computing Literature to derive a deeper understanding of the current landscape of ML applications for mental health from an HCI and computing science perspective.

In this regard, the model proposed, on a recent review by Sanchez et al. [170], which mapped the design space of technologies for supporting affective health as reported in HCI; and identified that most innovation has occurred in the areas of automated diagnosis, and self-tracking. As researchers who are actively working at the intersection of HCI, ML and mental health, we are excited about the prospective benefits that ML techniques could bring to mental health.

3.2 Procedural Flow of the Solution:

Skeletal User Sign-Up Flow Diagram: -

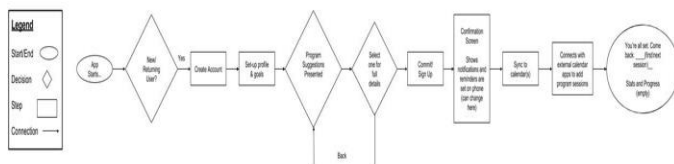


Fig 4: Flow Chart

Skeletal Mental Health Prediction Flow Diagram: - (Using Naïve Bayes Algorithm)

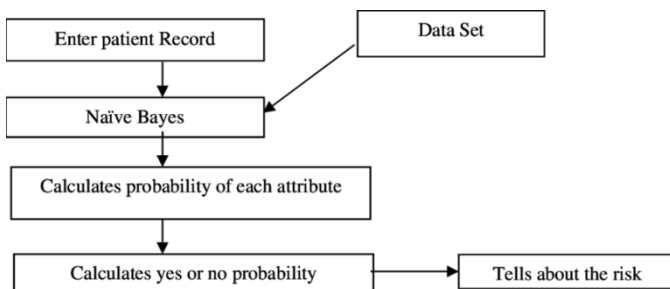


Fig 5: Prediction Flow Chart using Naïve Bayes

3.2 Benefits of such User-Based Interactive ML System

In this solution model, the user can get self-assessed themselves and look for a predefined set of solutions such as

- Seeking professional help anywhere, & anytime
- Discover new interest-based hobbies
- Start and build their own business as the hobby grows on them.
- Emergency based 24/7 SOS help service
- User can scale their business to the next level by connecting to fellow people having interests in the same hobby

Note: The user here doesn't have to run their entire business over the internet to benefit from online business opportunities. Small businesses may just require an email address to talk to their customers, customers, and suppliers. Other businesses might use their website to run their whole business on line.

As we know few of the benefits of online business include:

- global access, 24 hours a day, 7 days a week
- improved client service through greater flexibility
- cost savings
 - faster delivery of products etc.
 - increased professionalism
 - less paper wastes
- opportunities to manage your business from anywhere in the world.

In this model, the seller's benefit is that customers may prefer to visit your website to find out about the products and services instead of visiting them in person, which is easier via such solution platforms. They may even see the website address and your email on business cards and other promotional materials to get in touch directly if needed.

4. LIMITATIONS

Simultaneously, from the outset of the review, we are now aware that the development of effective and implementable ML systems is bound up with an array of complex, interwoven socio-technical challenges. In this regard, our solution is likely shaped by both our cautious optimism that ML approaches can be usefully and successfully applied in this domain; and a strong human-centered perspective on technology development as well as the commitment to creating responsible AI applications that seek to improve societal outcomes. Because of this, people simply take, occasionally, a marginally more critical perspective on research which suggests possibly high-income real-world interventions nonetheless stays only centered on technological invention.

Attempting to move the field forward in achieving a lot of its challenging aims for real world impact, the proposed

solution relies on a large dataset generated when there is a community to engage more actively and critically with many of the complex challenges involved to realize the successful use of ML in mental health. These challenges include generating large-scale, high-quality datasets, representing the diversity of the population, and gaining access to such datasets to develop more robust and fairer ML models (cf. [20]).

Mental health, in particular, affects a broad spectrum of people—spanning different demographics (age, gender, ethnicity), geographic locations, and socio-economic statuses—which calls for the inclusion of a wide range of people for this diversity to be reflected in the dataset to mitigate risks of bias [66, 73, 76, 80]. However, data collection is costly and particularly complicated where information is deeply personal as well as sensitive due to the stigma that is often associated with mental conditions [29, 53, 116, 190]. Subsequently, this raises the question of whether or not people trust ML-based applications with the collection and processing of their data, and to what extent and by what mechanisms people should agree to the collection of such personal data.

5. CONCLUSIONS

The system endeavors an excellent platform for women to improve their mental health and become independent at the same time. The easy accessibility and user-friendliness of the app and website will make the process of taking a self-assessment more straightforward and more accessible for women to take. This system will predict whatever the user's mental health is steady, normal, slightly affected or seriously affected. Thus, the system will provide essential solutions and provide a bridge to connect doctors without visiting in person. The empowerment will be achieved by making every woman independent by opening opportunities for different jobs, communities or even starting their startup. The system will help a woman earn and help them make a stable lifestyle. The system will also contain security for women.

Findings indicate a strong association about mental health deterioration of women due to widespread pandemic, i.e., COVID-19 and a dramatic increase in mental fatigue due to more work, with a significant effect rise in domestic spousal violence and poor mental health, which underscore the need for appropriate interventions.

The study further suggests that the effectiveness of self-help exercises may be limited without additional strategies that mobilize women, families, and communities to challenge the widespread acceptance of this issue and promote the effects of such instances in the long run. Longitudinal studies are needed to elucidate the complex causal relationships between socializing and more hobby-work. Due to less reach to the outer physical world, an

implicit platform to showcase the skills and connect virtually would result in more advantages in such cases.

6. FUTURE SCOPE

Designing such a solution and integrating it into an app and website-based platform will be very helpful for women to keep a track of their mental health.

This app and website will create awareness about mental health throughout the nation. Small scale industries will find a new boost and increase their production.

This app can lead to progress in the reduction of domestic violence and help every woman to be independent and confident.

7. ACKNOWLEDGEMENT

We take this opportunity to express our profound gratitude and deep regards to our project guide Prof. Sonali Patil for his cordial support, valuable information and guidance, which helped us in completing this task through various stages. We also would like to thank our H.o.D. Prof. Vijay Bhosale for providing his constant support and expert guidance, during the progress of this project, whenever asked for.

We extend our heartfelt regards to our Director Dr Geeta Lathkar for her guidance, monitoring and constant encouragement throughout this thesis. The blessings, help and guidance given by her from time to time shall carry us a long way in the journey of life on which we are about to embark.

We are obliged to staff members of our Computer Engineering Department, for the valuable information provided by them in their respective fields. We are grateful for their cooperation during the period of our assignment. Lastly, we thank almighty, our parents, siblings and friends for their constant encouragement without which this assignment would have not been possible.

REFERENCES

- [1] Almeida M, Shrestha AD, Stojanac D, Miller LJ. The impact of the COVID-19 pandemic on women's mental health. *Arch Womens Ment Health*. 2020 Dec;23(6):741-748. doi: 10.1007/s00737-020-01092-2. Epub 2020 Dec 1. PMID: 33263142; PMCID: PMC7707813. <https://link.springer.com/content/pdf/10.1007/s00737-020-01092-2.pdf>
- [2] Sediri, S., Zgueb, Y., Ouanes, S. et al. Women's mental health: acute impact of COVID-19 pandemic on domestic violence. *Arch Womens Ment Health* 23, 749–756 (2020).

- <https://doi.org/10.1007/s00737-020-01082-4>
- [3] Machine Learning in Mental Health - microsoft.com.
https://www.microsoft.com/en-us/research/uploads/prod/2020/06/Machine-Learning-in-Mental-Health_author_copy_June2020.pdf
- [4] Malhotra, Savita & Shah, Ruchita. (2015). Women and mental health in India: An overview. *Indian journal of psychiatry*. 57. S205-11. 10.4103/0019-5545.161479.
- [5] Sharma I, Pathak A. Women mental health in India. *Indian J Psychiatry [serial online]* 2015 [cited 2021 Apr 22];57, Suppl S2:201-4. Available from: <https://www.indianjpsychiatry.org/text.asp?2015/57/6/201/161478>
- [6] K Lalitha, A Reddy, L Devi. (2015). Depression and Coping among Women Working In Rural Areas. *International Journal of Indian Psychology*, 2 (4), DOI: 10.25215/0204.092, DIP: 18.01.092/20150204h
- [7] How covid-19 locked out women from jobs - mint. <https://www.livemint.com/news/india/how-covid-19-locked-out-women-from-jobs-11591772350206.html>
- [8] How women are at receiving end of the pandemic. <https://www.dailypioneer.com/2021/state-editions/how-women-are-at-receiving-end-of-pandemic.html>
- [9] How women are at receiving end of pandemic. <https://www.dailypioneer.com/2021/state-editions/how-women-are-at-receiving-end-of-pandemic.html>
- [10] Lockdown Locked within A close look at the shadow <https://timesofindia.indiatimes.com/life-style/health-fitness/de-stress/lock-down-locked-within-a-close-look-at-the-shadow-pandemic-and-womens-mental-health/articleshow/78515757.cms>
- [11] Benefits of doing business online. <http://smallbusinessfirst.kochiesbusinessbuilders.com.au/benefits-of-doing-business-online/>
- [12] <https://www.thehindu.com/opinion/op-ed/a-greater-impact-on-women/article31465962.ece>
- [13] <https://inbreakthrough.org/covid19-and-impact-on-women/>
- [14] Tate AE, McCabe RC, Larsson H, Lundström S, Lichtenstein P, Kuja-Halkola R (2020) Predicting mental health problems in adolescence using machine learning techniques. *PLoS ONE* 15(4): e0230389. <https://doi.org/10.1371/journal.pone.0230389>
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0230389>
- [15] Machine Learning in Mental Health: A Systematic Review of the HCI Literature to Support the Development of Effective and Implementable ML Systems
<https://dl.acm.org/doi/fullHtml/10.1145/3398069>