

# Levels of work stress among information technology professionals during COVID-19 pandemic in an Indian metropolis

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## ABSTRACT

**Introduction:** Amid the ongoing Non-Communicable Disease and COVID-19 pandemic, understanding prevalence and characteristics associated with work stress is vital from a health and economic perspective, more so among information technology (IT) professionals. **Objective:** To estimate the prevalence and factors associated with work stress among IT professionals during the coronavirus disease 2019 (COVID-19) pandemic in Bengaluru, India. **Materials and Methods:** A cross-sectional study was undertaken on a convenient sample of 356 IT professionals in Bengaluru, India, between September 2020 and March 2021 to assess work stress. The weblink to TAWS-16 (Tool to Assess and classify Work Stress) was provided for IT employees to self-report their experience of work-related stressors and coping abilities in the past 6 months. The prevalence and specific prevalence of work stress were calculated. Multi-variate logistic regression was conducted to identify factors associated with work stress. Ethical clearance was obtained from the Institutional Ethics committee, National Institute of Mental Health and Neurosciences, Bengaluru. Informed consent was obtained from study subjects. **Results and Conclusion:** The prevalence of work stress among IT professionals was 17.7% during the COVID-19 pandemic, with higher rates among employees aged 31 years and above, among female employees, and among employees with 4-7 years of work experience. More than 80% of the professionals experienced deadline pressures, long working hours, regular multi-tasking, and difficulty in maintaining work-life balance. Based on the results, it is recommended to integrate work-stress assessment in periodical medical examination of IT employees from a health promotion and productivity improvement perspective.

**Keywords:** Employees, IT, non-communicable diseases, occupational health, TAWS-16, work stress

## Introduction

Nearly 40% of the Indian population classified themselves as 'workers', of which 8% are employed in organized sectors.<sup>[1]</sup> Information Technology (IT) and IT-enabled service employees

are a key organized workforce owing to their significant contribution to India's gross domestic product. In the financial year 2019, nearly 4.1 million people were employed in the IT sector in India.<sup>[2]</sup> Their good health is vital for sustained economic growth and development of the enterprise and the country.<sup>[3]</sup>

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Fueled by various macro (globalization, urbanization, technology revolution, air pollution, and others) and micro level (long working hours, travel, target-driven work style, differential time zones, travel lifestyle change, and others) determinants,

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non-communicable diseases (NCDs), work stress, and mental disorders are emerging health priorities among IT employees.<sup>[4]</sup> Work stress in harmful proportions is associated with NCDs, mental disorders, and subsequent complications, adding to increased health care costs and decreased work productivity of enterprises, implying the need to identify and manage work stress at the earliest.<sup>[5]</sup>

Work stress is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope (WHO).<sup>[6]</sup> Low job security, excessive work demand, lack of job control, monotonous work, lack of organizational support, adverse physical working conditions, inflexible work hours, strained relationships at work, role conflict, ambiguity, and work-life imbalance are some of the known work-related stressors.<sup>[7,8]</sup> Though evidence regarding stress and psychological distress among IT workers is often published,<sup>[9-11]</sup> little is known about work stress and specific work stressors among IT professionals, especially during the COVID-19 pandemic.

It is quintessential to detect and manage harmful work stress at an early stage for optimum health and work efficiency. Existing tools assess stress in general, are too lengthy, and do not consider coping to define the construct of work stress. Toward this direction, a work-stress assessment tool, TAWS-16 (Tool to Assess and classify Work Stress),<sup>[12]</sup> was developed by the Centre for Public health and is used to estimate the prevalence of work-related stress and identify factors associated with work stress among IT professionals in Bengaluru during the COVID-19 pandemic.

## Objectives

- To estimate the prevalence of work stress among IT professionals in Bengaluru during the COVID-19 pandemic
- To identify the factors associated with work stress among IT professionals in Bengaluru.

## Methodology

Bengaluru is home to nearly 10 million people and is known as the Silicon Valley of India. The second wave of COVID-19 pandemic started during March 2021 in Bengaluru, and most IT professionals were working from home.<sup>[13]</sup> Prior to the second wave, a cross-sectional assessment was conducted on a convenient sample of IT professionals working in Bengaluru between September 2020 and March 2021. IT professionals with a minimum of 6 months of service in the IT sector (current employment) and providing informed consent were studied.

From a sampling frame of a list of IT companies in Bengaluru, IT companies were selected at random and information and invitation to participate in the study were sent to the human resources (HR) department. The invitation for participation was shared through the HR department to employees. The exact

number of employees to whom the invitation was forwarded from HR is not known to investigators.

Subsequently, employees from willing IT companies were given access and contacted via telephone (due to COVID-19 pandemic), and their informed consent was sought for the study. An email was sent to consenting and eligible IT professionals to participate in the study, which contained the link to the study instrument (TAWS-16). Upon receipt of the link, each participating IT professional created a specific user ID and password to access the study instrument (TAWS-16), ensuring confidentiality of information and security. Furthermore, the consenting IT professionals who subsequently failed to respond even after three attempts to collect data were defined as non-respondents and excluded from analysis. The process was repeated till the estimated sample size of 356 was achieved.

The Tool to Assess and classify Work Stress (TAWS-16) is a validated tool, and details of face, content, criterion, and construct validity are published elsewhere.<sup>[14]</sup> It has been used earlier to assess work stress among industrial employees, and the prevalence of work stress varied between 10 and 17%. Expecting 10% prevalence of work stress, 5% allowable error, and 80% power of test, the sample size was estimated at 139 (Sample size  $n = [DEFF * Np (1-p)] / [(d^2 / Z_{21-\alpha}^2 * (N-1) + p * (1-p)]$ ). It was doubled to account for secondary objective, and 20% was added to account for non-response, resulting in a minimum sample size of 333 IT professionals. Finally, 356 employees were studied.

TAWS-16 consisted of two parts: Part-1 and Part-2. Part-1 consisted of items to collect data regarding socio-demographic factors like age, sex, relationship status, number of dependents, distance between workplace and residence, years of work experience, average number of hours worked per day, and others. Part-2 consists of items to assess work stress and associated symptoms (TAWS-16). TAWS-16 was developed by the Centre for Public Health, National Institute of Mental Health and Neurosciences, Bengaluru, to assess work-related stress.

Part-2 of TAWS-16 consists of two sections, Section A for assessment of work-stress levels and Section B for assessment of symptoms suggestive of work stress.

**Assessment of work-stress level:** This section consists of 16 items to elicit information about work-related stressors across different domains. Details regarding domains of assessment and number of items for specific domains are mentioned in Table 1.

Each IT employee responded to items framed to enquire the presence of specific work stressors in the past 6 months. Response to each item consists of three options (“No, not at all” = 0, “Yes, to some extent = 1”, “Yes, to a great extent = 2”).

Employees responding either 1 or 2 (affirmative of exposure to work stressor) further answer the next item, which enquires if the employee “has felt stressed or distressed because of the stressor

**Table 1: The domains of assessment in TAWS-16**

Domains of assessment	Number	Serial No. in the tool
Role in organization: Role overload, Role ambiguity	3	1,2,3
Career development: Effort–reward imbalance, job security	4	4,5,6,7
Organizational environment: Working condition, Relationships with peers and superiors, responsibilities, Job control, Job demand		8,9,10,11,12
Organizational support	3	13,14,15
Work–life balance	1	16

experience”. The response consisted of four options (“No, not at all = 1”, “Yes, on few occasions, but I manage = 2”, “Yes, often and difficult to manage = 3”, and “Yes, very frequently and excessively stressed, difficult to manage = 4). This schema seeks to assess the ability of the employee to manage the work stressor and extent of stress experience due to the work stressor.

The work stressors assessed were experiencing time/deadline pressures, regular multi-tasking and unclear role in organization, multiple tasks (demands) by supervisors, lack of respect and recognition, delayed/no promotion, lack of job security, lack of remuneration/reward, long working hours, lack/no involvement in decision making about workload, friction or non-cordial relationship between colleagues/superiors, difficulty in delegating responsibilities to colleagues, compromised physical working conditions like ventilation, lighting and equipment, lack of supportive and adequate feedback/appraisal on the work done, lack of help/support from colleagues/seniors/supervisors, inadequate trainings to improve knowledge and the skill set, and difficulty in managing work–life balance). The schema in TAWS-16 assesses experience of work stressors as well as the ability of employees to manage the exposed stressor. Employees scoring 48 and above are classified as having work stress, 48–59 as mild work stress, 60–73 as moderate work stress, and >73 as severe work stress.

**Assessment of symptoms suggestive of stress:** In many employees, psychosomatic symptoms are often the first manifestation of work stress. Hence, TAWS-16 also captures the experience of symptoms suggestive of stress. Each employee reported their experience of common psychosomatic symptoms suggestive of work stress in the last 6 months (16 symptoms were asked). Responses are in the form of four options (“Never” =0, “Yes, occasionally (6–15 days in a month)” =1, “Yes, repeatedly (<10 days in a month)” =2, “Yes, regularly (almost on a daily basis)” =3).

Subjects scoring more than 16 are classified as having symptoms suggestive of work stress, 16–29 classified as mild stress symptoms, 30–36 as moderate, and more than 36 as severe work-stress symptoms. Apart from identifying prevalence of work stress, an intervention guide was provided based on cross-tabulation of stress and symptom scores. Employees with higher stress scores as well as higher stress symptom scores were priority for stress reduction interventions.

A web-based application was developed following the complete life cycle of software development where first the requirements were collected by the developers, the application was developed and constantly reviewed to make sure the requirements were met, and last, the application was tested thoroughly by the experts. Data collection was anonymous and unlinked as the names and personal details like phone numbers were not collected. Data were stored on a secured server, and access was only given to the people in the investigation excluding the names and company names of the participating IT professionals.

Data were collected in a self-reported format due to the COVID-19 pandemic in Bangalore. The questionnaire used was also tested simultaneously for validity and reliability by another investigator. Ethical clearance: Scientific and ethical clearance was obtained by NIMHANS

**Ethics Committee:** NO.NIMH/DO/IEC (BS and NS DIV) 2020 – 21.

### Statistical analysis

Data analyses were performed using SPSS 15.0 statistical software (SPSS Inc, Chicago, IL, USA). Subjects’ characteristics were summarized as mean  $\pm$  standard deviation (SD) for continuous variables such as age (in years) and work experience in the present workplace (in years) and categorical variables such as sex, distance of workplace from residence, relationship status, number of dependents are expressed as frequencies (n) and percentages (%). Prevalence of work stress and overall and specific prevalence rates per 100 employees along with 95% confidence intervals are provided. Employees scoring 48 and above are defined as having work stress (48–59 as mild work stress, 60–73 as moderate work stress, and >73 as severe work stress).

An intervention matrix was designed to decide interventions based on severity of work stress and the symptoms experienced by the participants. Participants with mild stress (score between 48 and 59) and who experience mild symptoms of stress (score between 16 and 29) were advised to undergo repeated assessment and counseling. Participants with moderate work stress (score between 60 and 73) and who experience moderate symptoms of stress (score between 30 and 36) were advised a detailed work-up and stress management training. Furthermore, those participants who experienced severe work stress (score more than 73) and severe symptoms of stress (score more than 36) were advised to undergo counseling, a detailed clinical work-up for NCD risk, and stress management training.

Univariate and multi-variate logistic regression analyses were performed with outcome variables as stress (present/absent) based on cut-off values described earlier. The covariates included age, sex, relationship status, distance to workplace from the residence, and years of work experience. All statistical assessments were considered significant at  $P < 0.05$ . Appropriate statistical tests were applied to estimate goodness of fit (Chi square and Hosmer Lemeshow test).

## Results

The socio-demographic characteristics of the IT professionals are depicted in Table 2. Among the 356 employees, 82% were aged 31 years and above with a mean age of 33 years. Nearly 63% were males, and 44% had work experience of 4–7 years in their current workplace with an average of 6.04 years of experience. Nearly 3% were either separated or divorced, and 53.7% of the employees had a daily commute of more than 7 km from home to office [Table 2].

The prevalence of work stress was 17.7% (95% CI 13.73, 21.66). Hence, during the COVID-19 pandemic, about 13.7 to 21.6% of IT employees reported work stress. Mild stress was most prevalent as compared to moderate or severe stress. The average stress score in TAWS-16 was  $32.77 \pm 14$ .

The prevalence of work stress was higher among females by 21.4%. Almost 18.8% of the participants aged above 31 years experienced work stress. The prevalence was the highest, that is, 22.8%, among those with 4 to 7 years of work experience as compared to those with 8 to 11 years who had 8.8% of work stress.

Around 91% of the IT professionals experienced timeline or deadline pressures. Unclear roles in the organization and regular multi-tasking are also reported as work stressors for 82.6% IT professionals. Approximately 82% participants had trouble in managing work–life balance and were unable to meet the demands of the supervisors as depicted in Table 3.

Among all the IT professionals, the odds of having work stress were almost double [AOR 1.9, CI (0.679, 5.443)] in the age group of 31 years and above as compared to those who were less than 30 years of age. Similarly, the odds of having work stress were higher [AOR 1.3, CI (0.595, 2.931)] in the IT professionals with a work experience of 4–7 years. Married professionals showed increased odds [AOR 1.38, CI (0.695, 2.758)] of work stress as compared to the professionals who were single, separated, or divorced. However, none of the findings were statistically significant as shown in Table 4.

## Discussion

The present study is a part of a larger validation study of TAWS-16 in IT employees in Bengaluru. The key strength is using TAWS-16, which is specific to assess and classify

**Table 2: Prevalence and specific prevalence of work stress among IT employees (n=356)**

Factors	Work stress		Total n (%)	Chi square test	P*
	Present n (%)	Absent n (%)			
Overall prevalence	63 (17.7%)	293 (82.3%)	356		
Age				0.708	0.400
18-30 years	9 (14.3)	55 (85.9)	64 (17.9)		
>31 years	54 (18.8)	238 (81.5)	292 (82.0)		
Sex				1.924	0.165
Male	35 (15.6)	190 (84.4)	225 (63.2)		
Female	28 (21.4)	103 (78.6)	131 (36.7)		
Years of work experience				6.421	0.093
6 months to 3 years	16 (16.2)	83 (83.8)	99 (27.8)		
4 to 7 years	36 (22.8)	122 (77.2)	158 (44.38)		
8 to 11 years	5 (8.8)	52 (91.2)	57 (16.01)		
>12 years	6 (14.3)	36 (85.7)	42 (11.79)		
Distance from work to residence				0.997	0.802
0 to 2 kms	5 (23.8)	16 (76.2)	21 (5.89)		
3 to 5 kms	17 (19.5)	70 (80.5)	87 (24.43)		
6 to 8 kms	15 (17.01)	73 (83.0)	88 (24.71)		
>8 kms	26 (16.3)	134 (83.8)	160 (44.94)		
Relationship status				0.669	0.716
Single	41 (17.2)	197 (82.8)	238 (66.8)		
Married	21 (19.4)	87 (80.6)	108 (30.3)		
Divorced/separated	1 (10.0)	9 (90.0)	10 (2.8)		
No. of dependents				1.861	0.394
0 to 2	50 (18.5)	221 (81.5)	271 (76.1)		
3 to 5	13 (16.9)	64 (83.1)	77 (21.6)		
More than 6	0 (0)	8 (100)	8 (2.2)		
<b>Numerical variables</b>	<b>Mean±SD</b>	<b>Mean±SD</b>			
Age	35.38±5.056	35.19±5.437			0.796*
Years of work experience	5.79±3.78	6.36±6.27			0.484*
Distance from work to residence	8.36±5.91	16.43±71.14			0.369*

\*Rest P values are Chi-square test of significance, P<0.05 for significance of association

work-stress levels, based on a combined experience of work-related stressors and employees' coping ability to the specific work stressor, which is in line with WHO definition of work stress. This aspect is lacking in most of the publicly available work-stress assessment tools in India. Other strengths include development of e-application for self-reporting-based data collection, which was useful during the COVID-19 pandemic situation and simultaneous validity assessments. The weblink ensured accuracy and completeness in data collection, and there is potential for modification of the application to cater to different industries.

TAWS-16 is brief, easy to administer, and easily understood by the employees. The web-based link is convenient to use and provides readily available score-based results (feedback) for the employees indicating their present work stress levels ("mild", "moderate", and "severe" work stress). TAWS-16 has already been used in various industries in over 3000 employees.

We observed 17.7% prevalence of work stress among IT professionals with higher prevalence among IT professionals aged more than 31 years (18.8%), female IT employees (21.4%), and employees with work experience of 4–7 years (19.4%). The possible reason could be that employees aged more than 31 years would presumably be in mid-level managerial roles with expectedly more exposure to work-related stressors.<sup>[15,16]</sup> Female employees are expected to perceive more work stress due to dual roles of managing demands in family and profession and are also likely to react more intensely to stressor life.<sup>[17,18]</sup> Several studies have shown that women have greater psychological vulnerability to stress, which suggests that they may react more intensely to stress compared to men, especially in a pandemic.<sup>[19,20]</sup> Prolonged commutation to work may lead to increased tiredness and fatigue, erratic working hours, and constant time pressure and act as a catalyst for increasing work stress.<sup>[21-23]</sup> However, we have not undertaken detailed assessment of factors associated with each reported work stressor as it is out of purview of the tool and this study. The detailed socio-demographic factors were part of a greater validation study; hence, there was no association between the factors studied and work stress.

Assuming a similar proportion of work stress (17.7%) across all types of workers, an estimated 88.5 million workers may suffer from work stress in India. From the organizational perspective, work stress can increase burn out, absenteeism, and presenteeism,

**Table 3: Distribution of work stressors among IT professionals (n=356)**

Work stressor	Yes n (%)
Time/deadline pressures	323 (90.8)
Regular multitasking and unclear role in organization	294 (82.6)
Multiple tasks (demands) by supervisors	292 (82)
Lack of respect and recognition	143 (40.2)
Delayed/no promotion	178 (50)
Lack of job security	245 (68.8)
Lack of remuneration/reward	197 (55.4)
Long working hours	313 (88.2)
Lack/no involvement in decision making about workload	134 (37.6)
Friction or non-cordial relationship between colleagues/superiors	104 (29.2)
Difficulty in delegating responsibilities to colleagues	129 (36.2)
Inadequate working conditions like ventilation, lighting, equipment.	93 (26.1)
Lack of supportive and adequate feedback/appraisal on the work done	158 (44.4)
Lack of help/support from colleagues/seniors/supervisors	146 (41)
Inadequate trainings to improve knowledge and skill set	83 (23.3)
Difficulty in managing work–life balance	292 (82)

**Table 4: Factors associated with work-related stress in IT professionals in Bengaluru city**

Variables	n (%)	Crude OR <sup>#</sup> (95% CI)	Adj OR <sup>§</sup> (95% CI)	P*
Sex				
Female	131 (36.7)	Reference		
Male	225 (63.2)	0.678 (0.390,1.172)	0.745 (0.409,1.359)	0.338
Age (in years)				
0-30	64 (17.9)	Reference	1.922 (0.679,5.443)	
>31	292 (82)	1.387 (0.646, 2.977)		0.219
Work experience (in years)				
0-3	99 (27.8)	Reference		0.179
4-7	158 (44.38)	1.531 (0.798, 2.937)	1.320 (0.595,2.931)	0.494
8-11	57 (16.01)	0.499 (0.172, 1.443)	0.439 (0.134,1.433)	0.173
>12	42 (11.79)	0.865 (0.313,2.389)	0.834 (0.260,2.683)	0.761
Distance of travel from residence to workplace (in kms)				
0-2	21 (5.89)	Reference		0.808
3-5	87 (24.46)	0.777 (0.250, 2.419)	0.561 (0.167,1.886)	0.350
6-8	88 (24.71)	0.688 (0.209, 2.072)	0.566 (0.170,1.883)	0.353
>8	160 (44.94)	0.621 (0.208, 1.84)	0.616 (0.195,1.946)	0.409
Relationship status				
Single	238 (66.8)	Reference		0.548
Married	108 (30.3)	1.160 (0.647, 2.078)	1.385 (0.695,2.758)	0.355
Separated/Divorced	10 (2.8)	0.534 (0.66, 4.330)	0.566 (0.067,4.757)	0.601

#: OR- Odds Ratio; §: AOR (Adjusted Odds Ratio); \*p-value<0.05 for significance of association in logistic regression analysis; †: CI- Confidence Intervals

which decreases productivity.<sup>[24]</sup> It is thus vital to reduce work stress from an economic perspective as well. Though Periodical Medical Examination (PME) of employees is conducted for early detection and management of occupational diseases and NCDs, there is limited emphasis to periodically detect harmful work stress, even though it is a part of OSHAs.<sup>[25,26]</sup> There is also no uniform system in place to identify and categorize harmful work stress in IT professionals, partly due to lack of easy-to-use, valid, and reliable work-stress assessment tools. TAWS-16 bridges this gap.

With nearly 5.87 million deaths due to NCDs (60% of all cause deaths), India is battling an NCD epidemic.<sup>[27]</sup> Nearly 75–80% of these NCD deaths are “premature” deaths.<sup>[28]</sup> The effects of the NCD pandemic are likely to spill over to workplaces. With work stress being a risk factor for NCDs, it is imperative for occupational and public health experts to recognize this paradigm shift in health priorities and develop systems for prevention and control of NCDs in IT companies and other workplaces in India. Developing tools to assess work stress and integrating the same into periodical medical examination systems is a positive step in this direction.<sup>[29]</sup> Integrating periodical work-stress assessment in PME will enable to understand linkages between work stress, NCDs, and NCD risk factors and make PME more comprehensive and provide a larger picture of employees’ overall health and well-being.<sup>[25]</sup>

We did not find any socio-demographic factors significantly associated with work stress as the main objective was to estimate prevalence of work stress. Being a convenient sample, there is limited generalization to all IT employees in the city.

As the study was conducted during COVID-19 pandemic, the findings also related to work stressors operating in a pandemic work-from-home situation. This gives opportunities to assess work stress during the post-pandemic phase to understand if work from home has resulted in work stress as against work from office.

The SDG Target 3.4 aims to reduce premature mortality from NCDs by one third through prevention, treatment, and promotion of mental health and well-being.<sup>[30]</sup> India has also adopted specific national targets and indicators aimed at reducing the number of global premature deaths from NCDs by 25% by 2025, following the “WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020”.<sup>[31]</sup> Stress reduction plays a pivotal role in achieving these national targets. Multiple evidence-based studies suggest a strong association of stress with NCDs like cardiovascular disorders, diabetes, stroke, and so on.<sup>[32-35]</sup> As workers account for nearly 40% of the population, stress assessment and mitigation need to be a part of overall NCD prevention efforts in occupational health systems.<sup>[36,37]</sup> There are several legislations to protect the rights and health of workers, like National Policy on Safety, Health and Environment at work<sup>[38]</sup> and Occupational Safety, Health and Working Conditions codes (OSH code 2020),<sup>[39]</sup> but none of these legislations provide emphasis on NCD prevention and work-stress assessments. The

existing policies should be inclusive to address NCDs, work stress, and their overall health implications. The strengthening and monitoring of existing policies in accordance with WHO Global plan of action on workers’ health should be a way forward to ensure betterment of workers’ health at national as well as global levels.<sup>[40,41]</sup> Finally, we conclude that work stress is commonly prevalent among IT professionals and regular screening for work stress is recommended in periodical medical examinations of IT professionals. It will also help to understand the effectiveness of interventions undertaken to reduce work stress. There is a need for further large sample studies to understand the other factors associated with work stress among IT professionals.

## Conclusion

The prevalence of work stress in our study was observed to be 17.7% (95% CI 13.73, 21.66). Mild stress was most prevalent as compared to moderate or severe stress. The specific prevalence was observed to be higher among females by 21.4%. Additionally, 18.8% of the participants aged above 31 years experienced work stress. However, we did not find any factors associated with work-related stress. Our study indicates that TAWS-16 is a useful tool and can be integrated in a periodical medical examination. We recommend the use of TAWS-16 to cater to a larger population.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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