SHORT ARTICLE

Prevalence of Occupational Stress and its associated factors among Industrial Workers of North Karnataka

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ABSTRACT

Introduction: Job related stress is increasing in today's world as companies adapt to newer technology causing mismatch in skill and resources, leading to mental distress among employees. Causes of occupational stress include long working hours, inadequate pay and workplace conditions. In India, the prevalence of moderate stress levels is 9.5%, with 10-20 persons in 1,000 suffering from some mental illness. **Aim**: To study the prevalence of occupational stress and its associated factors among industrial workers. **Materials and Methods**: A cross-sectional study was conducted in Belagavi, a city in North Karnataka. A questionnaire having 2 components was used, the first being the Perceived Stress Scale (PSS), a classic stress assessment instrument comprising questions on how often one felt a certain way during the last month. The second component was to establish the leading factors of occupational stress through questions regarding their working conditions, salary, etc. Blood samples withdrawn from the workers were used to measure Vitamin D levels using chemiluminescence micro-particle immunoassay (CMIA). **Results**: 3.4% of the 119 workers had low stress levels, 84% had moderate stress levels and 12.6% had high stress levels, with the number of breaks, sleep schedule and Vitamin D levels showing the highest association (calculated using chi square). More than 50% of the employees had insufficient (20-30ng/ml) or deficient (<20ng/ml) vitamin D levels, which correlated with their stress levels. **Conclusion**: The results of our study show a significant number of employees experiencing moderate stress levels which can interfere with their personal and professional lives. The positive associations highlight the need for workspace interventions targeted towards adequate rest breaks and healthy sleep practices.

KEYWORDS

Industrial workers, occupational stress, vitamin D, Perceived Stress Scale

INTRODUCTION

Mental health is a fundamental human right, which is an essential component of overall health and well-being. We can connect, function, cope and thrive better when we are in good mental health(1). In 2019, 1 in every 8 people around the world were living with a mental disorder(2). 10-20 persons per 1000 in India are known to suffer from some sort of severe mental illness among which anxiety and depressive disorders were found to be the most common(3).The prevalence rate of moderate stress was found to be 9.5%, which serves as a risk factor for various mental disorders(4).

Stress is the adaptive response that occurs to an external circumstance, which can cause behavioral, mental, and bodily changes. Due to intense rivalry brought on by urbanization and globalization, stress levels are rising in today's globe(5). The detrimental physical and psychological responses that arise when the needs of the job are not met by the employee is referred to as occupational or job stress(6). It is a progressive process in which individual cognitive function is affected along with having an adverse effect on ones health and productivity (6,7). Lack of control, high work demands, lack of information (8), abundant pressure(9), and low decision-making latitude(10) are examples of an unfavourable work environment that can contribute to occupational stress.

In India, there are over 98 million workers, majority of whom are in the unorganized sector. Regarding the mental health of workers in companies, there are no rules or regulations that have been laid (11).

Most of the studies available have mainly focused on occupational stress among doctors, nurses, teachers, and other groups. There are very few that took into account the prevalence of occupational stress among industrial workers and its ill effects.

Hence this study was conducted to assess the prevalence of occupational stress, its associated factors, and establishing a correlation between stress levels and vitamin D levels among industrial workers of North Karnataka.

Material & Methods

This cross-sectional study was conducted among 119 workers in an iron moulding industry in Belagavi.

Inclusion Criteria: All workers who are working in that industry for a minimum of one year.

Exclusion Criteria: Employees who have a known mental disorder and are on anti-psychotic medications, employees who are a known case of Vitamin D deficiency, and are being treated, workers who have any liver or kidney diseases, any malabsorptive conditions, thyroid and parathyroid disorders or any malignancies

Data collection procedure: The workers working in the industry were enrolled into this study as a part of regular health checkup. Ethical clearance was obtained from JNMC Institutional Ethics Committee with reference no. MDC/JNMCIEC/13 dated 02.02.2024. After taking written informed consent from the workers, evaluation of height, weight, body mass index, blood pressure, random blood sugar level of the subjects was conducted.

A pretested and predesigned questionnaire having two components was prepared. One component aimed at assessing the occupational stress levels using the Perceived Stress Scale (PSS) among the workers, and another to determine the factors associated with the same.

The Perceived Stress Scale (PSS) is a classic stress assessment instrument and shows how different situations affect one's behaviour. The PSS questions are broad in nature rather than incident specific and assess the degree to which people believe their lives are "unpredictable, uncontrollable, and overloading". It consists of questions on one's thoughts and feelings during the last month, the frequency of which is measured using a 5 point scale ranging from (0) Never to (4) Very Often. A total score ranging from 0 to 40 is achieved by reverse scoring the four positively worded items and then adding the total items. A score ranging from 0-13 is considered as low stress, 14-26 as moderate stress and 27-40 as high perceived stress.

The second questionnaire was prepared to establish the leading factors of occupational stress through questions regarding their working conditions, shifts, salary and sick leaves.

The vitamin D levels of the employees was also assessed. Blood was withdrawn from each worker and was transported to the diagnostic centre for analysis of the vitamin D levels using automated chemiluminescence micro-particle immunoassay (CMIA). Blood pressure was checked by an automated BP machine. Workers with hypertension, obesity, severe back pain, raised sugar levels, vitamin D deficiency was counselled about treatment and lifestyle changes.

Data analysis: The collected data was coded in Microsoft Excel and analysed using SPSS version 20. Categorical data were represented as frequency and percentages. Chi-square test and Pearson Correlation were applied.

Results

The data of 119 workers was analyzed, out of which 90 % were males and 10% females. Most of them were in the age group of 20-30 years, with a job experience of 5-10 years (*Table 1*). On analysing the stress levels using the PSS scale, we found that 100 of the 119 workers (84%) had moderate levels of stress, 4 (3.4%) had low levels of stress and 15 (12.6) had high levels of stress. The workers were also questioned about their working hours, monthly income, habits, etc to identify the leading factors that caused stress (*Table 2*). The vitamin D levels of the employees was determined and the values are mentioned in *Table 3*. After analysing the data from table 2 using the chi square test (*table 4*), we got significant values (<0.05) for two factors, indicating that the

- Number of breaks that are given in the day
- Sleep schedule of employees

had a positive correlation with the stress levels of the employees. The vitamin D levels of the employees was also measured, with more than 50% of the employees having insufficient (20-30ng/ml) or deficient (<20ng/ml) vitamin D levels. A chi-square test of independence was conducted to examine the relationship between vitamin D levels and levels of mental stress (categorized as high/moderate or none). The results were statistically significant, $\chi^2 = 12.76$, $p = 0.0017$. This suggests a strong association between lower vitamin D levels and higher levels of reported mental stress. Specifically, individuals with deficient or insufficient vitamin D levels were much more likely to report mental stress compared to those with sufficient vitamin D.

Table 1 Workers demographic details (n = 119)

Male	**107**	**90%**
Female	12	10%
20-30 years of age	65	54.6%
31-40 years of age	47	39.4%
41-50 years of age	7	6%
Job experience: <5 years	42	35.3%
Job experience: 5-10 years	77	64.7%

Table 2 Distribution of determinants of stress

		Frequency	**Percentage**
PSS	low stress	4	3.40%
	moderate stress	100	84.00%
	high perceived stress	15	12.60%
What according to you is your main cause of stress at work?	Working conditions	43	36.13%
	Nature of the job	38	31.93%

	Management practices	11	0.92%
	Life events	27	31.02%
For how many hours do you work in a week?	45-50 hours	52	43.70%
	50-55 hours	67	56.30%
	55-60 hours	0	0.00%
	60-65 hours	0	0.00%
Do you work in shifts?	Yes	78	65.50%
	No	41	34.50%
How many breaks do you get in a day?	1	40	33.60%
	2	63	52.90%
	3	16	13.40%
Duration of break during work	1	10	8.40%
	2	103	86.60%
	3	6	5.00%
Is there a policy at your place of work for managing stress at work	Yes	0	0.00%
	No	119	100%
What is your average income per month?	less than 5000rs	3	2.50%
	5000 rs-7000 rs	3	2.50%
	7000rs-10000rs	46	38.70%
	more than 10000rs	67	56.30%
Do you have enough savings at the end of the month?	Yes	67	56.30%
	No	52	43.70%
Are you permitted to take sick leaves?	Yes	113	95.00%
	No	6	5.00%
What is your mode of transportation to your workplace?	Walking	22	18.50%
	Private transport	83	69.70%
	Public transport	14	11.80%
Does your mode of transport align with your working hours?	Yes	92	77.31%
	No	27	22.69%
Smoking	Yes	83	69.74%
	No	36	30.26%
Drinking	Yes	67	56.30%
	No	52	43.70%
Paan Consumption	Yes	38	31.93%
	No	81	68.07%
Sleep schedule	Regular	27	22.68%
	Irregular	92	77.33%

Table 3 Prevalence of vitamin D deficiency

Vitamin D levels in ng/ml	Number of Participants	percentage (%)
Deficient (<20)	44	37
Insufficient (20-30)	58	49
Sufficient (>30)	17	14
Total	119	100

Table 4 Association between determinants of stress and stress levels

		PSS			P Value
		low stress	moderate stress	high perceived stress	
What according to you is your main cause of stress at work?	Working conditions	3(75)	18(35.3)	5(55.6)	0.099
	Nature of the job	0(0)	9(17.6)	4(44.4)	
	Management practices	0(0)	11(21.6)	0(0)	
	Life events	1(25)	13(25.5)	0(0)	
For how many hours do you work in a week?	45-50 hours	0(0)	47(47)	5(33.3)	0.122
	50-55 hours	4(100)	53(53)	10(66.7)	
	55-60 hours	0(0)	0(0)	0(0)	
	60-65 hours	0(0)	0(0)	0(0)	

Do you work in shifts?	Yes	1(25)	69(69)	8(53.3)	0.109
	No	3(75)	31(31)	7(46.7)	
How many breaks do u get in a day?	1	1(25)	33(33)	6(40)	0.006*
	2	0(0)	56(56)	7(46.7)	
	3	3(75)	11(11)	2(13.3)	
Duration of break during work	1	0(0)	9(9)	1(6.7)	0.779
	2	4(100)	85(85)	14(93.3)	
	3	0(0)	6(6)	0(0)	
Is there a policy at your place of work for managing stress at work	Yes	0(0)	10(18.9)	3(33.3)	0.357
	No	4(100)	43(81.1)	6(66.7)	
hat is your average income per month?	less than 5000rs	0(0)	2(2)	1(6.7)	0.767
	5000 rs-7000 rs	0(0)	3(3)	0(0)	
	7000rs-10000rs	1(25)	41(41)	4(26.7)	
	more than 10000rs	3(75)	54(54)	10(66.7)	
Do you have enough savings at the end of the month ?	Yes	3(75)	53(53)	11(73.3)	0.249
	No	1(25)	47(47)	4(26.7)	
Are you permitted to take sick leaves?	Yes	4(100)	95(95)	14(93.3)	0.863
	No	0(0)	5(5)	1(6.7)	
What is your mode of transportation to your work place?	Walking	1(25)	17(17)	4(26.7)	0.826
	Private transport	3(75)	71(71)	9(60)	
	Public transport	0(0)	12(12)	2(13.3)	
Does your mode of transport align with your working hours?	Yes	4(100)	66(89.2)	7(77.8)	0.456
	No	0(0)	8(10.8)	2(22.2)	
Smoking	Yes	3(75)	73(73)	13(86.6)	0.273
	No	1(25)	27(27)	2(13.4)	
Drinking	Yes	0(0)	23(37.7)	3(37.5)	0.741
	No	1(100)	38(62.3)	5(62.5)	
Paan Consumption	Yes	0(0)	11(18)	1(12.5)	0.834
	No	1(100)	50(82)	7(87.5)	
Sleep schedule	Regular	4(100)	18(18)	5(33.3)	0.0003*
	Irregular	0(0)	82(82)	10(66.7)	

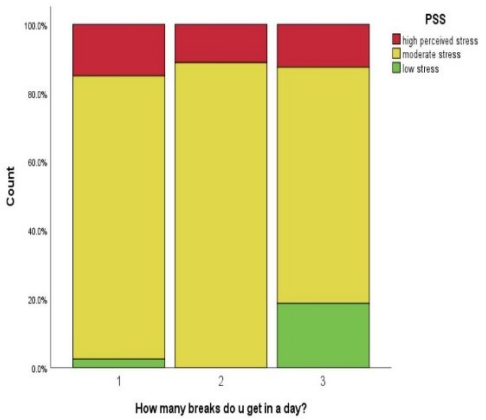
Chi Square Test; *Significant

Table 5 Association between vitamin D levels and mental stress

vitamin D level	mental stress	no mental stress
Deficient (<20 ng/ml)	26	1
Insufficient (20–30 ng/ml)	83	1
Sufficient (>30 ng/ml)	6	2

Chi-Square (χ^2) - 12.76; p-value - 0.0017

Graph 1



The above image is a stacked bar chart that displays the relationship between the number of breaks taken in a day and perceived stress levels. Each bar represents a category of breaks (1, 2, or 3) and is stacked to show the distribution of perceived stress levels within that category. The legend labeled "PSS" indicates the three stress levels.

Key Observations:

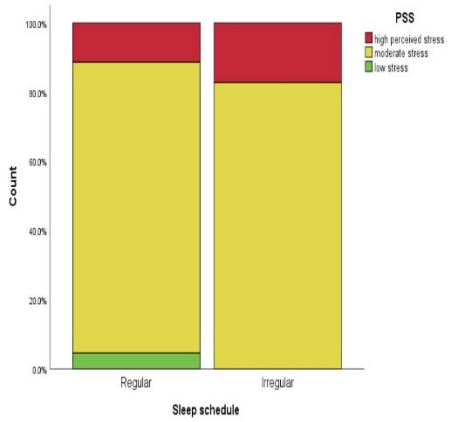
• One Break: The majority of people who take only one break in a day report moderate to high stress levels.

• Two Breaks: Similar to one break, those taking two breaks also predominantly experience moderate to high stress.

• Three Breaks: A significant portion of people who take three breaks report low stress levels, though moderate stress is still prevalent.

The chart suggests that taking more breaks in a day may be associated with lower perceived stress levels. However, it's important to note that this is a correlational observation and does not imply causation. Other factors could influence stress levels.

Graph 2



This is a stacked bar chart illustrating the relationship between sleep schedule regularity and perceived stress levels. Each bar represents a sleep schedule category (Regular or Irregular) and is stacked to show the distribution of perceived stress levels within that category.

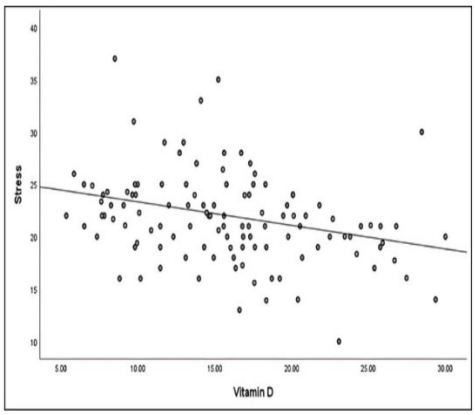
Key Observations:

• Regular Sleep Schedule: The majority of people with a regular sleep schedule report moderate stress levels, followed by high stress. A small percentage reports low stress.

• Irregular Sleep Schedule: Similar to those with a regular schedule, the majority report moderate stress, followed by high stress. A very small percentage reports low stress.

The chart suggests that there is not a substantial difference in perceived stress levels between individuals with regular and irregular sleep schedules. Both groups primarily report moderate to high stress. While there is a slight increase in the proportion of people reporting high stress in the irregular sleep schedule group, the overall pattern is similar.

Graph 3



This graph depicts a scatter plot showing the relationship between Vitamin D levels (x-axis) and Stress levels (y-axis).

The trendline (a straight line) drawn on the graph slopes slightly downwards from left to right, indicating a weak negative correlation. This means that as Vitamin D levels increase, stress levels tend to decrease slightly, but the relationship is not very strong.

DISCUSSION

The nature of work is changing at a tremendous rate. The global rise in urbanisation and industrialisation has led to an increase in occupational stress. Although a large number of research studies have been conducted with respect to the same, there are very few that have been done in an industrial setting.

Our study showed that 12.6% of the workers had high stress levels, which had a positive correlation with the number of breaks given per day and the employees' sleep schedule.

A study conducted in China showed that the prevalence of high occupational stress was 8.9% among industrial workers, with a positive correlation between job experience and stress levels(8). Although our study did not test for the effect of job experience on stress, it gave a significantly higher value of stress in industrial workers, particularly from a manufacturing industry in North Karnataka, India.

The number of breaks given per day can significantly impact the stress levels in employees, leading to mental and physical strain. Less number of breaks can lead to decreased concentration, more scope of errors along with physical discomfort like back pain and headaches. It decreases the productivity of employees that can instill a feeling of inadequacy and increased stress. Chronic exposure to stress can lead to psychological symptoms of anxiety and depression. Breaks also give employees a chance to interact with their colleagues and build relationships in their workplace, which is important for one's well being.

The sleep schedule of the employees also alters their stress levels, with 92 of them having irregular sleep (less than or equal to 6 hours of interrupted sleep at night). Since this study was conducted at an iron moulding industry, most of the employees have a physically demanding job, which can get affected if the employees do not get adequate rest, which is needed for muscle recovery and overall health.

Moy, FM., Bulgiba et al. study revealed that a high proportion (approximately 70%) of participants had insufficient vitamin D level of < 20 ng/ml(15). Jennifer Massa et al. study shows the dose-dependent association between lower levels of vitamin D and higher odds of having short sleep duration, poorer sleep efficiency, and increased sleep fragmentation(16).

Low vitamin D levels leads to a vicious cycle of poor sleep, causing an increase in stress levels and reduced recovery. This in turn leads to irritability along with muscle pain and fatigue among the employees.

Our study emphasises the importance of adequate rest to prevent occupational stress, which could manifest in terms of decreased self-esteem, physical discomfort and even accidents. Industries should provide sufficient number of breaks in the day of optimum duration that do not interfere with the flow of work, but also help in releasing fatigue.

Conclusion

Occupational stress is a pervasive issue that significantly impacts the overall health and job performance of industrial workers. The significant levels of stress detected among the workers can lead to cardiovascular (hypertension, myocardial infarction, etc) and musculoskeletal (joint pain, muscle pain and improper posture) diseases. Understanding the causes of occupational stress is essential not only for the well-being of employees but also for maintaining a positive atmosphere at one's workplace.

The observed associations between sufficient breaks in the day and sleep schedule have important implications for occupational health policies and practices. These findings highlight the need for targeted interventions towards adequate rest breaks and sleep practices, thereby safeguarding employee mental health. By addressing these modifiable factors, we can reduce the burden on employees and promote healthier workplaces.

Recommendation

Further studies should be conducted to determine predictors of occupational stress among industrial workers. A detailed assessment of various other factors (position, job experience, sex) should be taken into consideration. A more comprehensive assessment of the demographic and work related factors should also be considered for more accurate results. Lastly, future studies should consider diverse populations to enhance generalizability.

Limitation of the Study

Our study has several limitations. The cross-sectional design precludes causal inference, and longitudinal studies are necessary to confirm the relationship between the number of breaks and sleep cycle with occupational stress. Additionally, self reported hours of sleep may also alter the result.

Relevance of the Study

The prevalence of occupational stress poses significant public health concerns, underscoring the need for effective prevention and intervention strategies. It leads to musculoskeletal disorders and cardiovascular diseases, along with affecting one's mental health. Our study findings highlight the importance of addressing these through targeted interventions and health education.

Policy makers should prioritise education and awareness campaigns on the various risk factors that could lead to occupational stress. Maintaining a healthy work life balance should be encouraged and a healthy environment should be maintained in industries. The ill effects of stress should be discussed not only with the employees but also with the employer, and various strategies should be developed to combat the same.

Authors Contribution

All authors have contributed equally.

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Nil

Conflict of Interest

There are no conflicts of interest.

Declaration of Generative AI and AI Assisted Technologies in the Writing Process

The authors haven't used any generative AI/AI assisted technologies in the writing process.

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