Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 November; 6(1): 2140-2148

Analysis Of The Correlation Between Perceived Stress Level And BMI [Body Mass Index Among Working Professionals In Coimbatore, India: An Empirical Study.

Parimala Devi Kumara Swamy MSc (UK)., MSc[1*], Dr . K. Anusuya Devi MSc MPhil MCA PhD RD[2]

[1*]Research Scholar Department of Nutrition and Dietetics PSG College of Arts and Science Coimbatore, Tamilnadu, India
[2]Assistant Professor Department of Nutrition and Dietetics PSG College of Arts and Science Coimbatore, Tamilnadu, India

Abstract

Background: This study examines the relationship of perceived stress levels with BMI in college faculties from Coimbatore, India by correlating these factors with respect to gender, age, food habits, salary, and residence.
Methods: A cross-sectional study that involved 223 subjects, was used to analyze the role of socio-demographic factors, perceived stress, and BMI by using ANOVA, regression analysis, and Pearson correlation.
Results: The correlation of stress and BMI did not lie with gender and other socio-demographic factors like salary and residence. However, a positive correlation with respect to age was found, though the stress did not indicate much correlation with BMI. In conclusion, from the findings above, the researchers conclude that BMI is indeed affected significantly by age but social demographic factors such as gender, salary, and residence are not linked with an alteration of the relationship of stress with BMI.

Keywords: perceived stress, BMI [Body Mass Index], perceived stress level

1. Introduction

Perceived stress is the belief that an individual holds over their everyday life about how much of it can be considered as stressful (Cohen et al., 1983). Hare et al. (2021) performed a survey of more than 28000 working adults in the United States, aged 18–65 years old, of which almost ⅓, i.e., (31.7) had perceived high stress. It has been found that working people's mental and physical health are adversely affected from job related stress, more specifically perceived levels of job-related stress. These were heightened susceptibility to anxiety and depression (Kivimäki et al., 2006), hypertension (Landsbergis et al., 2013), both coronary artery disease (Eller et al., 2011), headache and low backache, muscle strain and gastrointestinal discomfort (Goh et al., 2015). Perceived stress was implicated to the use of unhealthy practices such as regular exercising, consumption of unhealthy foods, alcohol and smoking (Rod et al., 2009).
In addition, there have been significant links between perception of stress levels and BMI among working professionals (Berset et al., 2011). In one of the longitudinal studies, we found that baseline perceived stress was associated with higher BMI and prospectively ascertained weight gain a decade later (Barrington et al., 2014). It is postulated that stress, if it is chronic, induces several metabolic-endocrine changes that result in abdominal obesity (Epel, et al., 2001).

1.1 Perceived stress as a concept

Perceived stress sometimes is defined as the feelings or thoughts an individual has about the amount of stress they are under at a given time. It is not so much the amount of stress one experiences, but more importantly, how one perceives and evaluates those stressors. This subjectivity gives perceived stress relevance in understanding the psychological effects of stress. (Cohen et al., 1983). Perceived stress has been assessed through various measures, including the Perceived Stress Scale (PSS), which measures how unpredictable, uncontrollable, and overloaded people find their lives to be (Cohen, 1988).

1.2 Factors contributing to perceived stress among working professionals

Professionals experience numerous causes of perceived stress at the workplace. Among them are role ambiguity, role conflict, workload, and constant availability in the workspace, which have significant impacts on health at work. More significantly, the failure to draw proper boundaries between work and family life without having to juggle work against the caregiver/parenting obligation results in increased stress (Allen et al., 2000). Organizational culture, too, contributes to this-namely, competitive and unsupportive works environments make stress much worse than a more collaborative one (Bakker & Demerouti, 2007).

1.3 Prevalence of perceived stress among working professionals
The stress perceived among working professionals is increasingly becoming a global problem. According to the survey of the APA 2020, more than 60% of workers in the United States reported to suffer from frequent stress which is majorly work-related. Notably, almost half of the Europe respondents who were recently interviewed cited work-related stress as a major problem. It was observed in developing countries, where most cases of high stress were attributed to economic factors and fast-paced work rates in urban areas (Haque et al., 2023).

1.4 Correlation between perceived stress level and BMI
From previous research, it is evident that stress positively correlates with BMI. Constant stress elevates the production of cortisol, which triggers increased hunger and consumption of calorie-rich foods, leading to weight gain. Stress interferes with metabolisms that enable fat deposition primarily around the abdominal area. The relationship is cross-causative; higher BMI may lead to more stress since the condition leads to physiological distress and social embarrassment (Tomiyama, 2019).

1.5 Research Aim and Objectives
The primary aim of this study is to understand the correlation between perceived stress level and BMI among college faculties associated with engineering colleges in Coimbatore, India. The objectives that would be addressed in this regard are:
- To analyze the role of gender in the correlation between perceived stress level and their BMI among college faculties in engineering colleges in Coimbatore, India
- To evaluate the role of age in the correlation between perceived stress level and BMI among college faculties in engineering colleges in Coimbatore
- To determine the role of food habits in the correlation between perceived stress level and BMI among college faculties in engineering colleges in Coimbatore
- To evaluate the role of salary in the correlation between perceived stress level and BMI among college faculties in engineering colleges in Coimbatore
- To analyze the role of residence in the correlation between perceived stress level and BMI among college faculties in engineering colleges in Coimbatore

2. Literature review

2.1 Understanding of the concept of perceived stress and the various stressors among working professionals
As a composite construct, perceived stress reflects an individual's judgment about the extent of being stressed through a situation or environment, often related to his/her level of coping ability. For working professionals, the stressors are job-related, organizational culture-based, and Socio-environmental. A study by Meyer et al. in emergency medicine found differing perceptions of stress among clinical staff, particularly within a high-stress environment such as emergency departments, with psychological and social stressors appearing higher. (Cohen et al, 1983).

In addition, stress among caregivers is widespread and higher with the upsurge in care. There is a review of stress encountered by tracheostomy patients' caregivers pointing out that constant needs for optimum care and psychological burden of care significantly contribute to stress. This again reminisces the general understanding that health professionals are exposed to something unique in stressors that include emotional labor, time constraints, and expectation to deliver high-quality care. (Ellis et al, 2023)

2.2 Perceived stress and role of different socio-demographic factors impacting the level of perceived stress and BMI
Socio-demographic factors defining roles such as, age, gender, and socio-economic status determine stress levels and their consequences to health indicators such as Body Mass Index. Effect here is age though young professionals are likely to be highly stressed because they lack experience or have not yet fully established ways of overcoming the stress. According to different studies, younger employees who are faced with highly stressful working environments perceive higher levels of stress most of the time leading to health issues such as weight gain or loss in cases of stress-related situations . Gender also raises the level of stress perceived.

As an example, women commonly face highly perceived levels of stress resulting from the pressures of the differences between their professional life and private lives (Zamurayeva et al., 2021). On the other hand, male could discuss stress caused by occupational roles and financial burden; all these may determine their level of stress and hence BMI. Such general trends of gendered stressed trends are also contributed in general studies that cut across various occupations, such as nursing, where workload and professional demands cause stresses affecting them differently

2.3 Correlation between perceived stress level and BMI

The relationship between BMI and stress is further complicated by the fact that stressing itself results in both weight gain and weight loss, depending on behaviors and physiological responses to stress. For example, Meyer et al. in one literature review found a positive relationship between a gain in weight among EMS personnel with the increased level of self-reported stress from unwholesome coping like emotional eating. This can be said to go in line with other literature suggesting that stress is positively related to BMI especially in places where a job has high job demands and irregular hours of work

For instance, Luttenberger et al..aimed to prove that in jobs that entail extreme physical fitness, such as sports climbing, perceived stress effects are associated with low BMI due to the emergent nature of the aggregate effect of demand for physical activity and loss of food intake during the period experiencing stress. These findings point out how the association of stress with BMI is bidirectional and is influenced by individual and professional factors. (Torres et al, 2007)

2.4. Research Gap

Although the current literature provides plenty of information concerning the relation between perceived stress and sociodemographic factors-age, gender, and socio-economic status-there are still several research gaps. Importantly, very few studies address the long-term consequences of perceived stress in terms of BMI changes across varying industries among working professionals. The bulk of studies are cross-sectional and thus provide merely snapshots on correlations with stress-BMI relations, without longitudinal data to demonstrate long-term effects by repercussions of health implications.

3. Methodology

Location of Research: It was administered in Coimbatore, India.

Study Population and Sample Size: This survey had involved a sample of 223 participants taken from Coimbatore. Participants were adults falling between the ages of 18 and 65 years old, which corresponds to a broad range of age. This broad range was chosen to achieve a heterogeneous sample about health variables. More importantly, the number of men and women was perfectly balanced because gender has a significantly large effect on health outcomes, particularly BMI and inflammatory biomarkers. Of the 223 participants, the random selection of the fifty obese subjects was from the participants with BMI $\geq$ 30 and further followed up to be analyzed specifically on the particular inflammatory biomarkers based on their health status, lifestyle factors, and BMI measurements.

The study thus explored the differences in male and female patterns of inflammation among those people with a BMI of 25, considered overweight, and a BMI of 30, considered obese. Differences in the patterns of inflammation could thus be used to develop specific interventions for men or women.

Sample Size Justification: This sample size of 223 participants was large enough to generate sufficient statistical power that detects clinically important differences in biomarkers among the group of those overweight or obese and the comparison groups. The calculations used to estimate sample size were based on an effect size of 0.5, a 95% confidence interval, and an alpha of 0.05.

Inclusion/Exclusion Criteria: The subjects of the study should fall under the age group of 18 to 65 years and who live in Coimbatore city, while having a BMI of 25 and above. Chronic diseases, special diets, and recent surgeries or current intake of anti-inflammatory drugs would be considered exclusion criteria because they could change inflammatory markers.

Ethical Clearance: Ethical clearance was sought from the PSG Hospitals Ethical Committee. The participants were enlightened on the objectives, risks attached to the research, and their right to withdraw; hence, consent was sought.

Screening Procedure: This entailed standardized questionnaires used to screen individuals based on their age, medical history, and lifestyle. Moreover, the BMI of all the participants was calculated to determine who qualified for biomarker research.

Data collection: Demographic, lifestyle, and health-related variables that include Body Mass Index (BMI) and inflammatory biomarkers were collected from the 223 participants. A series of standardized questionnaires was applied to collect data in relation to lifestyle factors such as dietary intake, physical activity, and sleep patterns. Information related to demographics such as age and gender was collected. The FFQ is used to record long-term food habits, whilst the 24HR records short-term consumption. The other quality of sleep was surveyed using the PSQI. Perceived stress scale or PSS is also deployed to determine the levels of stress. The IPAQ is implemented to assess the level of physical activity.

Anthropometric data- The measurements for height and weight were recorded for calculating the values of BMI. Blood samples from the subjects also were drawn and tested for the concentration of inflammatory biomarkers like CRP, IL-6, and TNF-α. These blood samples were released for analysis in labs to undertake the estimation of inflammatory markers through the use of a widely practiced technique called ELISA.

Dietary and Lifestyle Evaluations: The respondents' food consumption was assessed using a Food Frequency Questionnaire and 24-Hour Dietary Recall. Lifestyle factors considered consisted of stress, physical activity, and the quality of sleep based on standardized instruments, among which were the Perceived Stress Scale, the International Physical Activity Questionnaire, and the Pittsburgh Sleep Quality Index.

Data Analysis: Using cluster analysis, different participant groups will be found based on shared eating habits, levels of inflammatory biomarkers, and lifestyle characteristics like physical activity, stress, and sleep. The relationship between predictor factors (e.g., dietary habits, stress, sleep, and physical activity) and binary health outcomes (e.g., increased vs. normal levels of inflammatory biomarkers) will be evaluated using multiple logistic regression. To investigate correlations between categorical variables, such as the link between inflammatory biomarker levels and dietary patterns (e.g., balanced, high-fat, high-carbohydrate), chi-square tests will be utilized.

In this study, some statistical techniques applied include descriptive statistics and ANOVA that were performed using the SPSS computer software. They indicate existence or otherwise of association among variables such as BMI, inflammatory biomarkers, and gender with other health factors. It established trends and significant correlations within the data analyzed.

4. Results

4.1 Empirical results

Results

a. Descriptive Statistics of Demographic Variables

The study involved 223 participants. Grouped them into two sets or groups that were based on demographic variables such as age, gender, and residence, as well as their Body Mass Index, BMI and perceived stress level. In the demographic analysis, it clearly reflected the inclusion of college faculties from engineering institutions in Coimbatore, India.

Table 1: Descriptive Statistics of Demographic Variables

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
score_Stress level	1	69	23.07	8.307	1.000	21.08	25.07	11	45
	2	153	24.36	10.273	.831	22.72	26.00	7	62
	Total	222	23.96	9.704	.651	22.68	25.24	7	62
BMI	1	69	25.680	4.0221	.4842	24.713	26.646	14.3	33.8
	2	153	26.663	4.9368	.3991	25.874	27.451	16.2	40.2
	Total	222	26.357	4.6849	.3144	25.738	26.977	14.3	40.2

Table 2: ANOVA within the group and between the groups

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
score_Stress level	Between Groups	78.769	1	78.769	.836	.362
	Within Groups	20733.866	220	94.245		
	Total	20812.635	221			
BMI	Between Groups	45.954	1	45.954	2.104	.148
	Within Groups	4804.589	220	21.839		
	Total	4850.543	221			

Regarding stress levels, the mean was 23.96 (SD = 9.70) among all participants. By gender, 69 participants were females, who comprised group 1, with a lower mean stress score (M = 23.07, SD = 8.31), and 153 participants were males, who comprised group 2 (M = 24.36, SD = 10.27), without differences between groups, p = .362. Distribution of BMI indicated that the mean average means BMI for the overall was 26.36 (SD = 4.68). Mean BMI for group 1 was at 25.68 (SD = 4.02), whereas group 2 slightly surpassed the above value at 26.66 mean BMI. Again, the difference between the two groups was insignificant in terms of BMI (p = .148). This implies that the distribution of BMI and stress levels is generally similar in all the groups regarding gender.

b. Perceived Stress and BMI

This study used a Pearson correlation analysis to determine if there is any relationship between perceived stress levels and BMI. The result gives a weak negative correlation between the levels of stress and BMI, r = -0.037, p = .579 meaning that there is no significant linear association between variables in this study. This empirical result would be supporting the null hypothesis that no correlation exists between perceived stress and BMI in this population.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.236[a]	.056	.047	7.694

a. Predictors: (Constant), score_Stress level, BMI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	769.399	2	384.699	6.498	.002[b]
1	Residual	13024.108	220	59.200		
	Total	13793.507	222			

a. Dependent Variable: Age
b. Predictors: (Constant), score_Stress level, BMI

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	28.619	3.263		8.771	.000
1	BMI	.370	.110	.220	3.353	.001
	score_Stress level	-.064	.053	-.079	-1.198	.232

a. Dependent Variable: Age

Another application of regression analysis was made in studying the role of age in the stress-BMI relationship. In this case, there was a positive association between the model and age since the coefficient on the relationship between age and BMI was positive (β = 0.37, p =.001) but negative and not significant for the relationship between age and level of stress (β = -0.064, p = .232). Thus, it is likely that as age increases, so does BMI, but age and stress level have no association with each other.

c. Socio-demographic Determinants of Stress and BMI

Gender: A repeated-measures ANOVA could be considered to see if gender impacted the interaction of perceived stress and BMI. In this case, there was found to be no gender interaction in the relationship as both the stress variables, p = .362, and the BMI, p = .148, provided no inter-subject variability between men and women. This would seem to suggest that gender was not a factor that seemed to mediate or impact the association between perceived stress and BMI in this population.

Correlation analysis was used to establish the role of food habits. In this case, there were no statistically significant linear relationships between food habits and either perceived stress or BMI, the Pearson correlation coefficient; r = .018, p = .787. Similarly, there was no relationship with skipping meals and either stress or BMI. However, frequency of snacking was related at a moderate but significant level to not eating, implying that frequent meal skippers also tend to snack more often.

Residence: It was another variable measured for its association with stress and BMI. An ANOVA analysis revealed that the correlation between stress and BMI was not significantly different between participants residing in different residential locations (p = .435 for stress, p = .592 for BMI). This shows that where a participant stays in Coimbatore has no main effect on either a participant's stress or BMI.

Table 3: Socio-demographic Determinants of Stress and BMI

Correlations

		BMI	score_Stress level	Food_Habit	Skip_Meals	Skipping_which_Meal	Snacking_Frequency	Freq_Eating_outside
BMI	Pearson Correlation	1	-.037	.018	-.037	.019	.008	-.067
	Sig. (2-tailed)		.579	.787	.578	.772	.903	.317
	N	223	223	223	223	223	223	223
score_Stress level	Pearson Correlation	-.037	1	.105	.013	.008	.022	.086
	Sig. (2-tailed)	.579		.116	.844	.904	.747	.202
	N	223	223	223	223	223	223	223
Food_Habit	Pearson Correlation	.018	.105	1	-.022	.083	-.001	-.033
	Sig. (2-tailed)	.787	.116		.749	.215	.985	.625
	N	223	223	223	223	223	223	223
Skip_Meals	Pearson Correlation	-.037	.013	-.022	1	-.833**	-.128	.215**
	Sig. (2-tailed)	.578	.844	.749		.000	.057	.001
	N	223	223	223	223	223	223	223
Skipping_which_Meal	Pearson Correlation	.019	.008	.083	-.833**	1	.159*	-.099
	Sig. (2-tailed)	.772	.904	.215	.000		.018	.141
	N	223	223	223	223	223	223	223
Snacking_Frequency	Pearson Correlation	.008	.022	-.001	-.128	.159*	1	-.018
	Sig. (2-tailed)	.903	.747	.985	.057	.018		.786
	N	223	223	223	223	223	223	223
Freq_Eating_outside	Pearson Correlation	-.067	.086	-.033	.215**	-.099	-.018	1
	Sig. (2-tailed)	.317	.202	.625	.001	.141	.786	
	N	223	223	223	223	223	223	223

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

d. Analysis of Salary and Its Relationship with Stress and BMI

Table 4: Analysis of Salary and Its Relationship with Stress and BMI

e. **Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
score_Stress level	1	90	23.50	9.459	.997	21.52	25.48	7	54
	2	83	24.53	10.333	1.134	22.27	26.79	9	62
	3	36	25.03	9.691	1.615	21.75	28.31	10	53
	4	13	21.46	6.437	1.785	17.57	25.35	12	31
	5	1	12.00	.	.	.	.	12	12
	Total	223	23.96	9.682	.648	22.68	25.24	7	62
BMI	1	90	26.243	4.1990	.4426	25.364	27.123	16.1	40.2
	2	83	27.130	4.8275	.5299	26.076	28.184	16.9	38.8
	3	36	25.742	4.4606	.7434	24.232	27.251	16.2	36.2
	4	13	23.854	6.5840	1.8261	19.875	27.833	14.3	34.8
	5	1	31.700	.	.	.	.	31.7	31.7
	Total	223	26.378	4.6842	.3137	25.759	26.996	14.3	40.2

Table 5: Analysis of Salary and Its Relationship with Stress and BMI

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
score_Stress level	Between Groups	311.259	4	77.815	.827	.509
	Within Groups	20501.378	218	94.043		
	Total	20812.637	222			
BMI	Between Groups	174.312	4	43.578	2.023	.092
	Within Groups	4696.776	218	21.545		
	Total	4871.088	222			

Relationship between salary and stress/BMI was explored through ANOVA. The result was that there was no significant variation in relation to salary on the overall stress levels (p = .509). Similarly, it presented no significant variation in BMI across categories of salary (p = .092). This suggests that for this population, the income level will not have a significant effect on perceived stress or BMI.

e.Correlation Between Perceived Stress, BMI, and Age

In-depth interactions between age, BMI, and perceived stress were further examined using regression models. The findings, in particular, suggest that there exists a significant relationship between age and BMI (β = 0.37, p = .001) such that participants who tend to be older possess higher levels of BMI scores. More importantly, the relationship between age and perceived stress is not significant (β = -0.064, p = .232), such that this sample does not experience significant effects of age on stress levels.

e. f. Correlation Between Perceived Stress, BMI, and Residence

Table 6: Residence, Stress and BMI correlation

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
score_Stress level	1	170	24.24	9.459	.725	22.81	25.67	7	53
	2	52	23.04	10.510	1.458	20.11	25.96	10	62
	Total	222	23.96	9.704	.651	22.68	25.24	7	62
BMI	1	170	26.451	4.7697	.3658	25.728	27.173	14.3	40.2
	2	52	26.052	4.4270	.6139	24.819	27.284	17.2	34.8
	Total	222	26.357	4.6849	.3144	25.738	26.977	14.3	40.2

Table 7: Residence, Stress and BMI correlation

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
score_Stress level	Between Groups	57.600	1	57.600	.611	.435
	Within Groups	20755.035	220	94.341		
	Total	20812.635	221			
BMI	Between Groups	6.329	1	6.329	.287	.592
	Within Groups	4844.215	220	22.019		
	Total	4850.543	221			

This paper assessed the effect of residence on the association between perceived stress and BMI among the faculties in Coimbatore. ANOVA analysis results failed to show a significant difference in stress or BMI between residential location settings. The stresses across the respondents' different locations in Coimbatore were the same (p = .435), as well as the BMI across the different locations in Coimbatore (p = .592). This implies that residence does not affect the stress-BMI interaction in this population. Hence, factors like location do not seem to play any significant role in modifying the stress-BMI interaction in these professionals.

4.2 Key Findings Summary

i. Stress perception: No gender difference was cited with the combined sample reporting an average stress score of 23.96.
ii. BMI: No gender difference in BMI either, with the sample reporting an average BMI of 26.36.
iii. Correlation between perceived stress and BMI: There was no significant linear correlation between perceived stress and BMI (r = -0.037, p =.579).
iv. Age and BMI: There exists a strong and positive correlation between age and BMI but not that between age and stress level.
v. Socio-demographic factors: Gender, residence, and salary were not factors correlated well with the relationship between stress and BMI
vi. Food habits: No possible relationship existed between food habits and stress and BMI except between meal skipping and snack for both stress and BMI where they were modestly correlated.

Therefore, the findings of this study are comparable with the previous studies because a weak or indirect relationship between perceived stress and BMI has been reported. In this respect, Schneiderman et al., in 2005, discuss that across populations, there is an inconsistent relationship between stress and BMI just like a weak correlation observed in the study, r = -0.037. However, the positive relationship between age and BMI in this study accords with literature since age has been associated with weight gain due to related metabolic and lifestyle factors (Palmer et al., 2022). Moreover, failure in significant gender differences in BMI-stress relationships also asserts a study by Adeojo et al in 2023 where gender did not considerably alter stress-BMI relationships. There was insignificant effect of socio-demographic factors such as residence and salary on stress and BMI. Individual lifestyle choices play a greater role than socio-demographic factors in determining stress and obesity outcomes.

5. Conclusion

These results indicate that while some demographic elements like age do have influences on BMI, the perceived levels of stress are largely independent of variables like gender, residence, salary, or type of food consumed. This weak association between stress and BMI reveals a significant necessity to conduct more research to better understand the complex dynamics between the variables in various populations.

REFERENCES

1. Berset, Martial et al. “Does stress at work make you gain weight? A two-year longitudinal study.” *Scandinavian journal of work, environment & health* vol. 37,1. (2011): 45-53. doi:10.5271/sjweh.3089
2. Wendy E. Barrington, Shirley A.A. Beresford, Bonnie A. McGregor, Emily White, Perceived Stress and Eating Behaviors by Sex, Obesity Status, and Stress Vulnerability: Findings from the Vitamins and Lifestyle (VITAL) Study, Journal of the Academy of Nutrition and Dietetics, Volume 114, Issue 11, (2014) Pages 1791-1799, ISSN 2212-2672, https://doi.org/10.1016/j.jand.2014.03.015.
3. Epel, E., McEwen, B., Seeman, T., Matthews, K., Castellazzo, G., Brownell, K. D., Bell, J., & Ickovics, J. R. Stress and body shape: Stress-induced cortisol secretion is consistently greater among women with central fat. *Psychosomatic Medicine*, (2000) *62*(5), 623–632. https://doi.org/10.1097/00006842-200009000-00005
4. Rod, Naja Hulvej, et al. "Perceived stress as a risk factor for changes in health behaviour and cardiac risk profile: a longitudinal study." *Journal of internal medicine* 266.5 (2009): 467-475.
5. Landsbergis, Paul A., et al. "Job strain and ambulatory blood pressure: a meta-analysis and systematic review." *American journal of public health* 103.3 (2013): e61-e71.
6. Kivimäki, Mika, et al. "Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees." *Bmj* 325.7369 (2002): 857.
7. Hare, David L., Toukhsati, S. R., Johansson, P., & Jaarsma, T. "Depression and cardiovascular disease: a clinical review." *European heart journal* 35.21 (2014): 1365-1372.
8. Goh, Joel, Jeffrey Pfeffer, and Stefanos A. Zenios. "The relationship between workplace stressors and mortality and health costs in the United States." *Management Science* 62.2 (2016): 608-628.
9. Schneiderman, Neil et al. “Stress and health: psychological, behavioral, and biological determinants.” *Annual review of clinical psychology* vol. 1 (2005): 607-28. doi: 10.1146/annurev.clinpsy.1.102803.144141
10. Palmer, Allyson K, and Michael D Jensen. “Metabolic changes in aging humans: current evidence and therapeutic strategies.” *The Journal of clinical investigation* vol. 132,16 (2022): e158451. doi:10.1172/JCI158451
11. Kivimäki, Mika & Batty, G & Pentti, Jaana & Shipley, Martin & Sipilä, Pyry & Nyberg, Solja & Suominen, Sakari & Oksanen, Tuula & Stenholm, Sari & Virtanen, Marianna & Marmot, Michael & Singh-Manoux, Archana & Brunner, Eric & Lindbohm, Joni & Ferrie, Jane & Vahtera, Jussi. Association between socioeconomic status and the development of mental and physical health conditions in adulthood: a multi-cohort study. The Lancet Public Health. (2020). 5. 10.1016/S2468-2667(19)30248-8.

12. Adeojo, O. M., I. O. Dada, and K. Ajayi. "Nutritional Status and Perceived Stress of Healthcare Professionals in Ekiti State, Nigeria." (2023). doi.org/10.15415/jmrh.2023.101001
13. Cohen, S. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), *The social psychology of health* (pp. 31–67). Sage Publications, Inc.
14. Allen, Tammy D., et al. "Consequences associated with work-to-family conflict: a review and agenda for future research." *Journal of occupational health psychology* 5.2 (2000): 278.
15. Bakker, Arnold B., and Evangelia Demerouti. "The job demands-resources model: State of the art." *Journal of managerial psychology* 22.3 (2007): 309-328.
16. Haque, Amlan. "The effect of presenteeism among Bangladeshi employees." *International Journal of Productivity and Performance Management* 72.4 (2023): 873-894.
17. Tomiyama, A. J. Stress and obesity. Annual Review of Psychology, 70 (2019): 703-718**.**
18. Torres, S. J., & Nowson, C. A. (2007). Relationship between stress, eating behavior, and obesity. Nutrition, 23(11-12), 887-894.
19. Dėdelė, Audrius, et al. "Perceived stress among different occupational groups and the interaction with sedentary behaviour." *International journal of environmental research and public health* 16.23 (2019): 4595.
20. Stewart-Knox, Barbara, et al. "Associations between obesity (BMI and waist circumference) and socio-demographic factors, physical activity, dietary habits, life events, resilience, mood, perceived stress and hopelessness in healthy older Europeans." *BMC public health* 12 (2012): 1-12.
21. Lopuszanska-Dawid, Monika, et al. "How stress is related to age, education, physical activity, body mass index, and body fat percentage in adult polish men?." *International Journal of Environmental Research and Public Health* 19.19 (2022): 12149.
22. Shinde, Veena Vasant. "Relationship of body mass index to job stress and eating behaviour in health care professionals-an observational study." *Obesity Medicine* 14 (2019): 100070.
23. Föhr, Tiina, et al. "Physical activity, body mass index and heart rate variability-based stress and recovery in 16 275 Finnish employees: a cross-sectional study." *BMC public health* 16 (2016): 1-13.
24. Diggins, Allyson, Cheryl Woods-Giscombe, and Sandra Waters. "The association of perceived stress, contextualized stress, and emotional eating with body mass index in college-aged Black women." *Eating behaviors* 19 (2015): 188-192.
25. Azagba, Sunday, and Mesbah F. Sharaf. "The relationship between job stress and body mass index using longitudinal data from Canada." *International Journal of public health* 57 (2012): 807-815.