Interlinking Obesity, Sleep, and Lifestyle- A Study on their Collective influence on Hypertension in University Employees

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***Abstract*— This observational study investigates the collective impact of obesity, sleep quality, and lifestyle behaviors on hypertension among university staff. The research was conducted with 83 employees at a university in Bangalore, evaluating anthropometric measurements (BMI, WHtR, WHR, ABSI), clinical indicators (BP, SpO_2), and self-reported information (sleep, stress, activity levels).**

Hypertension was identified in 47.6% of the participants, while central obesity (WHtR ≥0.5) was observed in 87.9%. Central adiposity emerged as the most significant predictor of hypertension (OR=6.36), followed by age (OR=1.09/year). Poor sleep quality and a sedentary lifestyle were associated with elevated BP and BMI, although they did not reach independent significance in regression analysis. There was no notable difference in hypertension risk based on gender.

These findings underscore central obesity as a modifiable target for health interventions in the workplace. The integration of ABSI and WHtR in health screenings, along with initiatives aimed at enhancing physical activity, reducing stress, and improving sleep, could potentially mitigate cardiometabolic risks.

Keywords: Hypertension, Central Obesity, Sleep Quality, Lifestyle Behaviors, University Employees, WHtR, ABSI, Occupational Health, Cardiometabolic Risk, Physical Inactivity.

I. INTRODUCTION

Globally, hypertension is a major public health concern as a significant modifiable risk factor for cardiovascular conditions. Researchers have identified sleep habits, lifestyle choices, and obesity as important, interconnected predictors of high blood pressure (BP), among many other contributing variables. Through metabolic, behavioural, and physiological processes, these factors combine to affect the risk of hypertension rather than acting alone (Hall et al., 2015). Due to growing urbanisation and lifestyle changes, obesity has become an epidemic on a global scale, with low- and middle-income nations seeing a sharp increase in its incidence (WHO, 2021). Specifically, Black South African women who live in rural areas have one of the highest rates of obesity in sub-Saharan Africa, where the prevalence is disproportionately high (Goedecke et al., 2018). Research has demonstrated a clear correlation between high blood pressure and the risk of cardiovascular disease and excess body weight, particularly central obesity as determined by waist circumference and waist-to-hip ratio (Larsen et al., 2021). This risk is further increased by lifestyle choices including sedentary time, physical inactivity, and eating habits. Non-communicable diseases (NCDs) have been linked to physical inactivity, and South Africa is one of the most physically inactive nations in sub-Saharan Africa (Guthold et al., 2018). Consuming processed foods, sugar-sweetened drinks, and high-sodium diets increases the risk of hypertension by causing obesity and energy imbalance (Malik et al., 2010). likewise, sleep's role in metabolic health has come to be seen as both an independent and interrelated element. According to St-Onge et al. (2016), weight gain and elevated resting blood pressure have been associated with inadequate or disturbed sleep patterns, which are frequently seen in those with demanding job schedules, such as university employees. When coupled with unhealthy lifestyle choices including low physical activity and high sedentary behaviour, sleep

duration of less than 7 hours per night has been linked to an increased risk of obesity and higher systolic and diastolic pressures (Grandner et al., 2014). According to a study on women in rural South Africa, diastolic blood pressure was inversely correlated with poor sleep quality, indicating that getting enough sleep may help prevent hypertension (Prioreschi et al., 2017). The intricate relationship between adiposity, lifestyle, and cardiovascular health was further supported by the discovery that raised BMI and central obesity were substantially linked to elevated blood pressure (Micklesfield et al., 2013). The combination of these risk factors is especially worrisome for occupational groups such as university personnel, who frequently deal with sedentary work settings, high levels of stress, and unpredictable schedules. For instance, anthropometric measurements and stress have an impact on the musculoskeletal conditions and weak grip strength that nurses commonly display (Yang et al., 2020). These disorders are connected to more general health outcomes including hypertension in addition to physical function (Chin et al., 2021). In light of these relationships, the purpose of this study is to examine how obesity, sleep habits, and lifestyle choices all affect university workers' risk of developing hypertension. The study looks at the interactions between these variables in an effort to find modifiable risk patterns that may guide focused interventions for preventing chronic diseases and promoting workplace health.

II. BACKGROUND OF THE STUDY

A useful and non-invasive stand-in for total muscular strength and physical fitness is grip strength, which is becoming more and more popular. In addition to functional performance, it is linked to the onset and advancement of a number of chronic illnesses, such as hypertension and cardiovascular disease (Soysal et al., 2021; Bobos et al., 2020). Nurses are more susceptible to musculoskeletal problems and physical exhaustion due to the high physical demands they encounter in their jobs, especially in the healthcare industry, where they often lift, position patients, and operate medical equipment (Sun et al., 2023). The grip strength of 200 staff nurses and 200 nursing students was investigated by Savci et al. (2024) in a recent cross-sectional study carried out in Turkiye. Notwithstanding notable variations in age, body mass index (BMI), and the frequency of musculoskeletal disorders, the results revealed no discernible variation in grip strength between the two groups. The impact of body composition and central adiposity on physical strength was highlighted by the authors, who found that height, neck circumference, and waist-to-hip ratio were significant predictors of grip strength, accounting for 57% of its variation (Savci et al., 2024).

III. NEED FOR THE STUDY

While prior research, such as that conducted by Savci et al. (2024), has investigated correlations between musculoskeletal health, body composition, and occupational performance, few have combined these results with cardiovascular risk factors like hypertension. The research is especially lacking in a thorough analysis of the combined effects of lifestyle, sleep habits, and obesity on blood pressure in professional populations such as university staff. Due to their frequent sedentary work schedules, elevated stress levels, and inconsistent sleep patterns, these people are more vulnerable to non-communicable diseases linked to their lifestyle. Furthermore, studies have demonstrated that poor eating habits, getting less than seven hours of sleep, and having a higher body mass index are all linked to a higher risk of hypertension and metabolic syndrome (Gangwisch et al., 2006; Patel & Hu, 2008). The combined consequences of these factors are still not well understood, though. Although the Savci et al. study offers a starting point, it does not directly assess blood pressure or sleep metrics, which calls for a more comprehensive, multi-factorial approach. This emphasises how urgently research on these interconnected factors—obesity, sleep, lifestyle choices, and their combined impact on hypertension in university staff members is needed. Such studies would provide vital information for creating targeted health treatments and preventative plans in institutional settings.

IV. AIM OF THE STUDY

To investigate the combined influence of obesity, sleep patterns, and lifestyle behaviours such as physical activity, sedentary time, and stress on the prevalence and risk of hypertension among university employees.

V. OBJECTIVES OF THE STUDY

1. To assess the prevalence of hypertension, overweight, and obesity among university employees using anthropometric and clinical measures such as ABSI, BMI, waist-to-hip ratio, waist-to-height ratio, and blood pressure levels.
2. To evaluate sleep patterns and quality among university employees through SATED and examine their relationship with blood pressure.
3. To examine lifestyle behaviours including physical activity, sedentary time, dietary habits, and stress levels, and their associations with obesity and hypertension.
4. To identify significant predictors of hypertension using multivariable analysis involving obesity indices, sleep duration/quality, physical activity levels, and psychosocial stress.

VI. METHODOLOGY

The research was carried out among the employees of S-VYASA University city campus in Bangalore, which included teaching, non-teaching, and administrative personnel aged between 25 and 60 years. The criteria for inclusion consisted of employees aged 20–60 years, regardless of gender, who were willing to provide informed consent. Individuals were excluded if they were unable to communicate (either verbally or non-verbally), were uncooperative or unwilling to participate, or had known musculoskeletal or neuromuscular disorders that could potentially influence grip strength.

This observational study utilized a convenient sampling method with a total sample size of 83 participants. Individuals who fulfilled the eligibility criteria were recruited after obtaining informed written consent. A contact diary was kept for each participant, documenting personal details such as name, age, gender, phone number, and department for follow-up and record-keeping. Each participant underwent a thorough history-taking process, which included chief complaints, pertinent medical history, and lifestyle factors. Subsequently, subjects were evaluated for anthropometric, clinical, and lifestyle-related parameters as part of the study's extensive data collection process.

Data collection encompassed three main areas: anthropometric, clinical, and self-reported measurements. Anthropometric evaluations included height, weight, waist circumference, and hip circumference, which were utilized to compute various body composition indices. Clinical metrics such as blood pressure (both systolic and diastolic), heart rate (BPM), and oxygen saturation (SpO_2) were assessed to determine cardiovascular and physiological health. Furthermore, self-reported data was gathered on demographic factors (age, gender, occupation), sleep quality through the SATED questionnaire, exercise and personal habits (including alcohol and tobacco consumption), as well as perceived stress levels. Flexibility evaluations were also documented to enhance the comprehensive assessment of physical health.

All measurements were taken using standardized procedures and calibrated instruments to ensure accuracy and reliability. The collected data were then entered into a structured datasheet and statistically analysed to assess the prevalence and determinants of overweight and obesity among the participants.

VII. RESULTS

Table i. Demographic Profile

Category	Count (n)	Percentage (%)
Total Participants	83	100.0
Male	38	45.8
Female	45	54.2
Mean Age	33.1 ± 9.6 years	
Age Range	20–57 years	
Dominant Occupation	Academic Staff	53.0%

The workforce under study comprises a balanced gender distribution slightly favouring females (54.2%), and the average age is 33.1 years, reflecting a young to middle-aged cohort. Academic staff dominate the occupational profile, indicating a professional and cognitively active sample, which may influence health patterns differently than in more labour-intensive workforces.

Table ii. Blood Pressure Classification

Category	Systolic (mmHg)	Diastolic (mmHg)	Count	Percentage (%)
Normal	<120	<80	22	26.8%
Elevated	120–129	<80	21	25.6%

Category	Systolic (mmHg)	Diastolic (mmHg)	Count	Percentage (%)
Stage 1 HTN	130–139	OR 80–89	19	23.2%
Stage 2 HTN	≥140	OR ≥90	20	24.4%
Total Hypertension (Stage 1+2)	≥130 or ≥80	—	39	47.6%

American Heart Association (AHA) 2017 Hypertension Guidelines

The prevalence of hypertension (47.6%) among employees highlights a significant public health burden. While 26.8% have normal BP, 47.6% fall into elevated or hypertensive categories. These findings underscore the urgent need for early identification and continuous monitoring to prevent progression toward cardiovascular morbidity.

Table iii. Body Mass Index (BMI) Classification

Category	Range	Count	Percentage (%)
Underweight	<18.5	4	4.8%
Normal	18.5–24.9	37	44.6%
Overweight	25.0–29.9	30	36.1%
Obese	≥30.0	12	14.5%
Overweight + Obese	≥25.0	42	50.6%

The prevalence of excess body weight is concerning, with over half (50.6%) of the population exceeding the normal BMI threshold. This trend, when combined with the earlier hypertension findings, suggests a potential clustering of cardiometabolic risks in this workforce.

Table iv. Central Obesity Risk (WHR and WHtR)

Measure	Risk Cut-off	Prevalence
WHtR ≥ 0.5	Central Obesity	87.9%
WHR (Males ≥1.0, Females ≥0.85)	High Risk	76.1% (females), 8.1% (males)

A staggering 87.9% of individuals exhibit central obesity per the WHtR measure, strongly implicating central fat accumulation as a dominant risk factor. This distribution is skewed by gender, with significantly more females classified at high risk via WHR, suggesting targeted gender-specific interventions are warranted.

Table v. ABSI (A Body Shape Index)

Quartile	Range	Count	Risk Level
Q1	0.061–0.077	21	Lower Risk
Q2	0.078–0.081	21	Average Risk
Q3	0.082–0.085	20	Elevated Risk
Q4	0.086–0.095	21	High Risk

The ABSI quartile distribution shows a clear stratification of risk, with 25% of participants falling into the highest mortality risk quartile. ABSI, which accounts for waist circumference normalized to height and weight, offers a nuanced view of risk beyond BMI and is especially important in highlighting visceral fat's impact on health. A higher ABSI value corresponds to a greater proportion of abdominal fat, which is a key factor in cardiovascular and metabolic risks. The unique contribution of ABSI lies in its ability to provide a more refined risk stratification, particularly in scenarios where BMI and waist circumference might present a "conundrum" (e.g., high mortality risk at both high and low BMI/WC). ABSI's linear relationship with death rates, even after adjusting for other risk factors, underscores its value in assessing cardio-metabolic health. It highlights that a reduction in weight alone might not improve risk classification if waist circumference remains constant, emphasizing the importance of fat distribution over total weight.

Table vi. Sleep Quality (SATED Score)

Category	Score Range	Count	%	Mean Systolic BP
Poor	0–4	9	10.8%	129.1 ± 18.2
Fair	5–7	36	43.4%	119.8 ± 14.6
Good	8–10	38	45.8%	118.4 ± 12.1

An inverse relationship is observed between SATED scores and systolic blood pressure, where individuals with poor sleep demonstrate significantly higher BP. Sleep disturbances therefore emerge as modifiable behavioural risk factors for hypertension management.

Table vii. Lifestyle and Behavioural Health

Activity Level	%	Mean BMI	HTN Rate
Sedentary	30.1%	26.8	64.0%
Active (Yoga, Gym, Sports)	44.9%	24.6	37.9%

Physical inactivity is strongly associated with both elevated BMI and higher hypertension prevalence. Promoting regular physical activity could have a two-fold benefit: reducing obesity and managing blood pressure.

Table viii. Stress and Substance Use

Category	%	HTN Rate
High Stress	51.8%	58.1%
Low Stress	48.2%	45.0%
Both Alcohol & Smoking	6.0%	80.0%

Psychosocial stress and substance use amplify the burden of hypertension. The data reveal alarming hypertension rates in those reporting dual substance use and high perceived stress, emphasizing the need for integrated mental and behavioral health support in workplace wellness programs.

Table ix. Predictor of hypertension (logistic regression)

Predictor	OR	95% CI	Significance
Central Adiposity Factor	6.36	(2.63, 15.40)	$p < 0.001$
Age	1.09 per year	(1.03, 1.16)	$p = 0.003$
Sleep & Stress Factor	1.16	Not Significant	$p > 0.05$
General Physical Health Factor	0.76	Not Significant	$p > 0.05$
Gender (Female vs. Male)	1.35	Not Significant	$p > 0.05$

Central adiposity is a robust and statistically significant predictor of hypertension, according to the logistic regression analysis, with an odds ratio (OR) of 6.36 and a 95% confidence interval (CI) of 2.63 to 15.40. We can be 95% certain that the genuine effect is between a 2.6-fold and 15.4-fold increase in risk, meaning that those with more abdomen fat are more than six times as likely to develop hypertension as people with lower central adiposity. Additionally, age has a significant correlation, with an OR of 1.09 and 95% CI of 1.03 to 1.16. This means that the odds of hypertension rise by 9% for every year of age, with the real effect probably ranging from a 3% to 16% increase.

Other predictors, including gender (OR = 1.35), general physical health (OR = 0.76), and sleep and stress factors (OR = 1.16), were not statistically significant because their p-values were higher than 0.05 and their confidence intervals probably included 1, suggesting that their impact on the risk of hypertension was uncertain. These findings highlight the necessity of age-based hypertension monitoring in this cohort as well as central obesity treatment.

VIII. STUDY LIMITATIONS AND FUTURE DIRECTIONS

Regarding the associations found, causal inference is limited by the observational design. The study's generalisability to other professional groups may be limited by its small sample size (n=83) and preponderance of academic workers. The effectiveness of focused interventions for central obesity reduction, the implementation of comprehensive wellness programs that address the various risk factors identified, and the long-term relationships between workplace factors and cardiovascular health should all be the focus of future research.

In order to better understand the interaction between sleep and stress variables and central adiposity in the development of hypertension, the non-significance of these factors in the multivariable model calls for more research with bigger sample sizes and more thorough evaluation instruments.

IX. CONCLUSIONS

Based on this study, university employees had an exceptionally high prevalence of both central obesity (87.9%) and hypertension (47.6%), with central adiposity appearing as the most significant predictor of hypertension risk. A paradigm change in occupational health screening from BMI-based evaluations to thorough anthropometric evaluations that include WHtR and ABSI measurements is supported by the data.The population's confluence of several modifiable risk factors—such as central adiposity, physical inactivity, poor sleep, and occupational stress—makes them ideal candidates for evidence-based workplace wellness initiatives. The six-fold increase in the risks of hypertension linked to central adiposity is one of the strongest correlations found in occupational health literature, and it

emphasises the urgent need for focused therapies that target central fat reduction as opposed to overall weight control. These results have important ramifications for occupational health policy and encourage the creation of all-encompassing, multifaceted wellness initiatives tailored to academic work settings.

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