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PREVALENCE OF OVERWEIGHT AND OBESITY AMONG UNIVERSITY EMPLOYEES AND ITS ASSOCIATION WITH ANTHROPOMETRIC MEASUREMENTS AND HAND GRIP STRENGTH

Dr. Shreesha[1], Dr.Sriraghunath S[2], Dr. Nidhi B Iyer[3], Dr. Chaitrali Kulkarni[4], Dr. Sasanka Sekhar Pradhan[5]

[1] Assistant professor, [2] Dean, Professor, [3] Assistant professor, [4] Associate professor, [5] Assistant professor,
[1]Department of Allied & Healthcare,
[1]S-VYASA Deemed to Be University, School of Advanced Studies, Bengaluru, Karnataka, India

Abstract: The escalating prevalence of overweight and obesity worldwide poses a major public health challenge, especially in sedentary working populations such as university staff. The aim of our study was to evaluate the burden of overweight/obesity among university employees and to investigate the relationship between overweight/obesity and established anthropometric parameters as well as Hand Grip Strength (HGS).Cross-sectional observational study of 83 university employees in Bengaluru, India. Anthropometric parameters such as Body Mass Index (BMI), Waist Circumference (WC), Waist-to-Hip Ratio (WHR), Waist-to-Height Ratio (WHtR) and HGS were recorded through standard procedures. Data were analyzed to determine the prevalence of overweight and obesity and their correlation with these physical indicators.The study observed that 55.4% participants were either overweight 39.8% or obese 15.7%. Obese/overweight individuals had significantly more WC, WHR and WHtR compared to normal BMI ($p < 0.001$) , with an increased risk for central obesity. The WHtR was the best predictor and all the overweight and obese subjects went over the high-risk cut-off. But, the difference in HGS based on BMI groups was not significant ($p = 0.808$). BMI showed strong positive correlation with WC ($r = 0.820$), WHtR ($r = 0.836$) and hip circumference ($r = 0.789$), but weak and negative with HGS ($r = -0.121$).More than half of the university workers in the study were overweight or obese, and core measures of obesity showed higher correlations with BMI than did hand grip strength. These results highlight the necessity of regular health exams that focus on abdominal obesity and focused workplace wellness initiatives. For academic institutions to support comprehensive health strategies, more research should take into account lifestyle factors and broader physical fitness parameters.

Index terms : Overweight, Obesity, University employees, Anthropometric measurements, Body Mass Index (BMI), Waist Circumference (WC), Waist-to-Hip Ratio (WHR), Waist-to-Height Ratio (WHtR), Hand Grip Strength (HGS), Central obesity, Sedentary lifestyle, Workplace wellness.

I. INTRODUCTION

Obesity is “a chronic complex disease defined by excessive fat deposits that can impair health”. Obesity and overweight are now major issue of public health due to their significant contribution to the burden of chronic illnesses like diabetes, cardiovascular issues, and numerous types of cancer.(World Health Organization, 2021). Sitting at work, a type of sedentary activity that occurs outside of leisure time, has been linked to weight gain and obesity. These work-related trends have been closely linked to higher metabolic hazards and body mass index (BMI) (Thorp et al., 2011).Moreover, High levels of occupational stress and effort-reward imbalance, however, were linked to higher cholesterol levels and body mass index. (Kivimäki et al., 2006).

By 2050, over half of adults will be overweight or obese, according to a global assessment, indicating the critical need for interventions targeted at high-risk occupational categories (GBD Obesity Collaborators, 2024).Similarly, Zubery et al. (2021)

identified a 68.9% combined prevalence of overweight and obesity among Tanzanian professionals, including educators highlighting the burden among knowledge workers.

Overweight and obesity have become significant public health concerns worldwide, and university employees are particularly at risk due to sedentary work environments and irregular schedules. A cross-sectional study conducted among academic and non-academic staff at the University of Nigeria reported that 37% of employees were overweight and 6.7% were obese, highlighting a substantial prevalence of these conditions within university settings (Anoshirike et al., 20219).

Handgrip strength (HGS) is a simple, non-invasive indicator of muscular strength and overall health. Although some research has found a positive relationship between BMI and HGS because of higher fat-free mass, strength is adversely affected by fat mass. (Zaccagni et al., 2020). Conversely, Dhananjaya et al. (2017) found that BMI and HGS did not significantly correlate, with weak negative associations in overweight and obese individuals.

II. NEED OF THE STUDY

These findings emphasize that body composition, rather than BMI alone, is a more accurate predictor of muscular strength. It is therefore essential to understand the prevalence and contributing factors of overweight and obesity among university employees in order to inform future health assessments and workplace health strategies. The goal of this research is to discover the prevalence of overweight and obesity among university workers and to assess the anthropometric and physical factors that are linked to these conditions, such as hand grip strength, body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR), and waist-to-height ratio (WHtR).

OBJECTIVES

Primary Objective:

- To determine the prevalence of overweight and obesity among university employees.

Secondary Objectives:

- To evaluate physical and anthropometric factors linked to overweight and obesity, including hand grip strength, WC, WHR, WHtR, and BMI.

RESEARCH QUESTION

- What is the prevalence of overweight and obesity among university employees, and what are the key anthropometric and physical determinant associated with it?

III. RESEARCH METHODOLOGY

3.1 Study Population:
All willing employees (teaching, non-teaching, and administrative staff) of the university aged between 20 and 60 years.

3.2 Eligibility Criteria:

Inclusion Criteria:

- Employees aged 20–60 years
- Any Gender
- Willing to provide informed consent

Exclusion Criteria:

- Patients who are unable to communicate (verbal/nonverbal/both)
- Uncooperative and unwilling participants
- Individuals with known musculoskeletal or neuromuscular disorders that may affect grip strength

3.3 StudyDesign:
Observational study

3.4 StudyArea:
S-VYASA Deemed to be university,School of Advanced Studies, Bengaluru

3.5 Sample Size: 83

3.6 Sampling procedure: Convenient Sampling

3.7 Data Collection: Subjects for the study were recruited from **S-VYASA Advanced School of Studies, Bangalore**. Participants who met the **inclusion criteria** were enrolled after obtaining informed written consent. A **contact diary** was maintained for each subject, containing personal details such as **name, phone number, department, age, and gender** for follow-up and record-keeping purposes. Every participant had their medical history, lifestyle characteristics related to the study, and any chief complaints thoroughly recorded. Participants were measured for their **weight and height** (for the purpose of determining the BMI) ,**WHR, WHtR and HGS** using a hand dynamometer

Standardized protocols and calibrated equipment were used for all measurements in order to guarantee precision and reliability. The prevalence and contributing factors of overweight and obesity among the participants were then evaluated by statistically analyzing the data that had been gathered and entered into a structured datasheet.

3.8 Data Gathering Instruments:

- Weighing scale
- Stadiometer
- Measuring tape
- Hand dynamometer

IV. RESULTS

This statistical analysis examines the prevalence of overweight and obesity among 83 university employees and evaluates associated anthropometric and physical determinants including BMI, WC, WHR, WHtR, and hand grip strength.

Study Population Characteristics

Table 1: Demographic profile of study participants (N=83)

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	38	45.8
	Female	45	54.2
Age Groups	20-29 years	25	30.1
	30-39 years	28	33.7
	40-49 years	23	27.7
	50+ years	7	8.4
Occupation	Faculty/Academic	44	53.0
	Administrative	20	24.1
	Support Staff	19	22.9

The study included 83 participants in total. The distribution of genders revealed that women (54.2%) were slightly larger in number than men (45.8%).The age of participants ranged from 20 years and above. The largest age group was 30–39 years, comprising 33.7% of the sample, followed by 20–29 years (30.1%) and 40–49 years (27.7%). A smaller proportion of participants (8.4%) were aged 50 years and above. Regarding occupational roles, more than half of the participants were from the faculty/academic category (53.0%), while 24.1% were administrative staff, and 22.9% were support staff. This demographic distribution highlights a balanced representation in terms of gender and a diverse spread across age groups and occupational categories within the institution.

Table 2: Key variable of descriptive statistics

Variable	Mean ± SD	Median	Range	95% CI
Age (years)	33.1 ± 9.6	30.0	20-57	31.0-35.2
Height (m)	1.60 ± 0.09	1.60	1.41-1.79	1.58-1.62
Weight (kg)	68.4 ± 13.9	67.4	43.8-107.5	65.4-71.4
BMI (kg/m²)	26.6 ± 4.6	25.8	15.7-36.7	25.6-27.6
Waist Circumference (cm)	91.8 ± 12.4	91.0	65-120	89.1-94.5
Hip Circumference (cm)	101.3 ± 10.2	101.0	75-130	99.1-103.5
WHR	0.90 ± 0.08	0.90	0.73-1.09	0.88-0.92
WHtR	0.57 ± 0.06	0.57	0.38-0.73	0.56-0.58
Hand Grip Strength (lbs)	56.0 ± 21.8	50.0	20-110	51.2-60.8

Table 2 presents the anthropometric and physical characteristics of the participants (N = 83). The mean age was **33.1 ± 9.6 years** (range: 20–57), indicating a moderately young adult group. The average weight was 68.4 ± 13.9 kg, and the average height was 1.60 ± 0.09 m.. The BMI was 26.6 ± 4.6 kg/m² on average suggesting a prevalence of overweight and obesity. The average waist and hip circumferences were **91.8 ± 12.4 cm** and **101.3 ± 10.2 cm**, yielding a **WHR of 0.90 ± 0.08** and a **WHtR of 0.57 ± 0.06**, both indicating potential central obesity risk. The average **hand grip strength** was **56.0 ± 21.8 lbs** (range: 20–110 lbs), reflecting variability in muscular strength. Overall, the data reflect a young adult population with diverse body composition and varying levels of physical fitness and health risk.

Table 3: BMI classification distribution

BMI Category	BMI Range (kg/m²)	Frequency (n)	Percentage (%)	95% CI
Underweight	< 18.5	3	3.6	0.8-10.1
Normal Weight	18.5-24.9	34	41.0	30.5-52.0
Overweight	25.0-29.9	33	39.8	29.4-50.8
Obese	≥ 30.0	13	15.7	8.7-25.0
Combined Overweight/Obese	**≥ 25.0**	**46**	**55.4**	**44.4-66.1**

Table 3 shows the BMI distribution of the participants. A majority of them fall into higher BMI categories. Only **3.6%** were **underweight** (BMI < 18.5), with a **95% CI of 0.8–10.1%**. About **41.0%** had **normal weight** (BMI 18.5–24.9), with a **95% CI of 30.5–52.0%**. **39.8%** were **overweight** (BMI 25.0–29.9), with a **95% CI of 29.4–50.8%**. **15.7%** were **obese** (BMI ≥ 30.0), with a **95% CI of 8.7–25.0%**. When combined, **55.4%** of participants were either **overweight or obese**, with a **95% CI of 44.4–66.1%**.This indicates that more than half of the group is at risk due to elevated BMI.

Table 4: Risk indicators by weight status

Risk Indicator	Normal Weight (n=34)	Overweight/Obese (n=46)	p-value	Effect Size
Waist Circumference (cm)				
Mean ± SD	81.9 ± 8.8	99.1 ± 10.7	<0.001***	1.78
High Risk (>94cm M, >80cm F)	8 (23.5%)	41 (89.1%)	<0.001***	-
Waist-to-Hip Ratio				
Mean ± SD	0.87 ± 0.08	0.93 ± 0.07	<0.001***	0.80
High Risk (>0.9 M, >0.85 F)	12 (35.3%)	35 (76.1%)	<0.001***	-

Waist-to-Height Ratio				
Mean ± SD	0.51 ± 0.04	0.62 ± 0.04	<0.001***	2.75
High Risk (>0.5)	15 (44.1%)	46 (100%)	<0.001***	-
Hand Grip Strength (lbs)				
Mean ± SD	55.3 ± 22.1	56.5 ± 21.8	0.808	0.05

The significance level is ***p<0.001, **p<0.01, and p<0.05.

Cardiometabolic risk factors for people with normal weight and those who are overweight or obese are contrasted in Table 4. With a substantial effect size (d = 1.78, p < 0.001), the waist circumference of the overweight/obese group was significantly greater (99.1 ± 10.7 cm) compared to that of the normal weight group (81.9 ± 8.8 cm).According to waist circumference, a higher percentage of overweight/obese people (89.1%) were at high risk than people of normal weight (23.5%, p < 0.001). The overweight/obese group had strong effect sizes (d = 0.80 and 2.75, respectively) and significantly higher WHR and WHtR (p < 0.001). Interestingly, every participant who was overweight or obese went over the WHtR high-risk threshold. However, the hand grip strength did not significantly differ between groups (p = 0.808, d = 0.05), indicating that the muscle strength levels of the groups were similar. While muscular strength seems to be unaffected, these results point to a strong correlation between a higher BMI and an increased risk of central obesity.

Table 5: BMI correlation with anthropometric and physical determinants

Variable	**Correlation with BMI (r)**	**Strength**	**Direction**	**Significance**
Waist Circumference (cm)	0.820***	Very Strong	Positive	p < 0.001
Hip Circumference (cm)	0.789***	Strong	Positive	p < 0.001
Waist-Hip Ratio	0.352***	Weak	Positive	p < 0.001
Waist-Height Ratio	0.836***	Very Strong	Positive	p < 0.001
Hand Grip Strength (lbs)	-0.121	Negligible	Negative	Not significant

BMI was found to have a substantial positive link with hip circumference (r = 0.789, p < 0.001), waist circumference (r = 0.820, p < 0.001), and the waist-height ratio (r = 0.836, p < 0.001), according to Pearson correlation analysis. The waist-hip ratio showed a weak positive correlation (r = 0.352, p < 0.001). A **small and non-significant negative** connection (r = -0.121) was found between hand grip strength and BMI. These findings imply that measures of central adiposity have a stronger correlation with BMI than do measures of functional strength.

V. DISCUSSION

The present study emphasizes the high prevalence of overweight and obesity among university employees, aligning with global and regional trends observed in occupational settings. In a study from Arusha City, Tanzania, 68.9% of working adults were found to be either overweight or obese, demonstrating that sedentary jobs significantly contribute to weight gain (Zubery et al., 2021). This is consistent with our finding that 55.4% of participants were either overweight or obese.

Obesity has been consistently linked with increased morbidity and mortality from diabetes, cardiovascular disease and some cancers (World Health Organization, 2021). In a cross-sectional study among Nigerian university staff, 37% were overweight and 6.7% were obese, suggesting that academic institutions are not immune to this global issue (Anoshirike et al., 2019).

Recent studies have confirmed the strong correlation between BMI and key indicators of obesity, including WC and WHtR, as seen in this study. Sultana (2025) demonstrated that WHtR significantly outperformed BMI in predicting type 2 diabetes among Bangladeshi adults, emphasizing the importance of assessing central fat distribution over general adiposity. Our findings reinforce this, as BMI showed strong positive relation with WC (r = 0.820) and WHtR (r = 0.836), further supporting the utility of central obesity indicators in metabolic risk assessment.

Given that abdominal obesity has stronger link to insulin resistance and metabolic disease than overall obesity, this pattern of central fat accumulation is alarming (Després et al., 2008). Research indicates that, especially in Asian populations, the WHtR may be a more efficient screening method for cardiovascular problems than BMI (Ashwell et al., 2012). Interestingly, hand grip strength did not differ significantly between normal and overweight/obese participants in our study. Similar results were reported by KT and AR (2024), where no significant differences in grip strength were found across BMI categories among young adults.

In a study by Vivek et al. (2024), no difference is that statistically significance in handgrip strength was observed across BMI groups in either males or females, suggesting that BMI alone may not be a reliable indicator of muscular strength in college-aged individuals. Furthermore, age emerged as a significant determinant of overweight in several studies. For instance, Roy et al. (2021) found that the mean body weight increased over time in Indian industrial workers, with overweight prevalence highest among older employees. The same trend was observed in our study, where participants aged 30–49 made up the majority of overweight/obese individuals.

Other factors, such as occupation type and duration of service, may influence weight gain due to reduced physical activity and prolonged sitting (Thorp et al., 2011). Furthermore, weight gain has been linked to psychosocial factors like poor sleep and job stress. Kivimäki et al. (2006) identified that work stress significantly increases the risk of metabolic disorders, which could be particularly relevant in university environments where stress levels are high. Finally, our findings support the need for comprehensive, multi-dimensional approaches to employee wellness that include regular screening of waist circumference and BMI, alongside promoting active lifestyles through workplace wellness programs. Encouraging employees to incorporate physical activity into their daily routines and making healthier food options available on campus could contribute to improved outcomes.

Limitations of the study includes,since the information was gathered at a single point, we can't know which factor came first or how they influence each other. Furthermore, the research was restricted to a single university, which could potentially impact the findings' applicability to other professional groups or environments. The **convenience sampling method** may introduce selection bias, as participants who volunteered may differ from those who did not. Furthermore, important lifestyle variables such as **dietary habits, physical activity levels, sleep quality, and stress** were not assessed, which may act as confounding factors. Lastly, the study assessed **only hand grip strength** as a physical parameter; inclusion of other muscular fitness or endurance measures could have provided a more comprehensive understanding of physical health.

Future research should aim to include **longitudinal designs** to assess changes in weight status and associated determinants over time, allowing for better understanding of causality. Expanding the study to a **larger, multi-center sample** would enhance the generalizability of the findings across diverse university populations. It is also recommended to incorporate validated tools for evaluating **diet, stress levels, sleep patterns, and physical activity**, which are known contributors to obesity. Inclusion of **more diverse physical assessments**—such as aerobic capacity, and muscular endurance—would provide a fuller picture of employees' health. Finally, implementation and evaluation of **targeted workplace interventions** focusing on obesity prevention, including ergonomic modifications, wellness education, and physical activity promotion, should be prioritized in university settings.

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