

ORIGINAL ARTICLE

IMPACT OF SOCIO-DEMOGRAPHIC, LIFESTYLE AND NUTRITIONAL FACTORS ON HYPERGLYCAEMIA AMONG MALE UNIVERSITY EMPLOYEES

Anosha Khan Shafee, Zia ud Din*, Muhammad Ibrar*, Adeena Aman*, Mahnoor Nadeem*, Muneeba Shah*, Malaika Khan Shafee*, Sana Shahid*

Facilitation Centre Coordinator, Benazir Nashonuma Program, Emergency Satellite Hospital, Nahaqi, Peshawar, *Department of Human Nutrition, The University of Agriculture Peshawar, Pakistan

Background: Hyperglycaemia poses significant health risks. This study investigates hyperglycaemia among male university employees due to their high-risk lifestyle factors and higher prevalence of diabetes in Pakistani males. **Methods:** The study was conducted among male university employees (teaching and support staff, n=243) at a university in Peshawar, Pakistan. Socioeconomic and lifestyle data were collected using validated questionnaires. Nutritional assessments included physical measurements and diet quality evaluation. Weight, height, and waist circumference (WC), were taken with standardized tools. Body composition parameters, including body mass index (BMI), total body fat (TBF), and visceral body fat (VBF), were assessed using validated techniques. Diet quality was evaluated through subjective measures. Fasting blood glucose (FBG) levels were determined with a glucometer. **Results:** Significant associations were observed between hyperglycaemia and anthropometric indicators, as well as body composition. Hyperglycaemic individuals had higher BMI (30.5 vs 24.9 Kg/m²), TBF (29.4% vs 22.2%), VBF (13.6% vs 8.3%), and WC (100.0 Cm vs 90.7 Cm), indicating central obesity. Hyperglycaemic participants also exhibited lower physical activity levels and poorer sleep quality. Linear regression analysis revealed significant predictors of FBG levels, with TBF ($\beta=1.63, p<0.05$) and BMI ($\beta=1.80, p<0.05$) positively associated, while higher consumption of the five food groups was negatively associated ($\beta=-4.00, p<0.05$). **Conclusion:** The findings underscore the importance of body composition, particularly BMI and TBF, in predicting hyperglycaemia. Promoting balanced diets and minimizing ultra-processed food consumption are essential strategies to mitigate hyperglycaemia risk among university employees.

Keywords: Body Mass Index, Diet, Hyperglycaemia, Life Style, Obesity, Sleep Quality

Pak J Physiology 2025;21(3):37–40, DOI: <https://doi.org/10.69656/pjp.v21i3.1844>

INTRODUCTION

Glycaemic status, an essential measure of blood glucose concentration, serves as a key indicator of metabolic health. Maintaining optimal glycaemic levels is critical for physical and psychological well-being, as it significantly influences energy, mood, and overall health.^{1,2}

Global projections indicate a rising prevalence of hyperglycaemia, increasing to an anticipated 10.9% (700 million) by 2045 from 9.3% (463 million) in 2019.³ In Pakistan, the diabetes prevalence among adults reached 26.7% by 2022, with 33 million reported cases.⁴ The disease burden is exacerbated by gender disparities and limited screening facilities, particularly in rural areas, necessitating urgent interventions to mitigate its impact on morbidity and mortality.⁵

Metabolic health is intricately linked to anthropometric and biochemical markers, such as blood glucose levels, reflecting the efficiency of energy metabolism pathways. Factors like age, lifestyle, dietary habits, and physiological conditions significantly influence glycaemic health.⁶ Research demonstrates that balanced diets and regular physical

activity correlate with healthier glycaemic profiles, while sedentary behaviours and poor dietary practices are associated with adverse outcomes.⁷

Obesity and hyperglycaemia are interrelated challenges that elevate the risks of cardiovascular diseases, diabetes, and certain cancers.⁸ Overweight and obesity are the 5th leading causes of global mortality.⁹ Sedentary job roles, common among university employees, exacerbate obesity and related metabolic disturbances. Dietary irregularities and low physical activity exacerbated these risks, highlighting the importance of targeted interventions.

This study investigates hyperglycaemia among male university employees due to their high-risk lifestyle factors and higher prevalence of diabetes in Pakistani males. The goal was to identify trends in hyperglycaemia across age groups and recommend healthier lifestyles for mitigating metabolic disorders.

MATERIAL AND METHODS

This cross-sectional study was carried out at the University of Agriculture, Peshawar, from Nov 2022 to Nov 2024. The initial sample size was 250, but due to

the minimal representation of female participants, they were excluded from the study. The final sample comprised 243 randomly selected male university employees. Participants included both teaching and support staff. Inclusion criteria were: university employees residing in Peshawar, free from any chronic diseases, (e.g., diabetes, hypertension, cardiovascular disease, kidney disease, or other metabolic disorders), and not on regular prescription, (i.e., medication taken consistently for ≥ 3 months). Exclusion criteria were: non-university employees, non-residents of Peshawar, individuals with chronic diseases, and those on regular prescription. Participants were selected from departmental records provided by the university registrar. Informed consent was obtained. Participation in the study was voluntary.

Socio-demographic, medicinal history, physical activity level, nutritional intake, and diet quality data were gathered using structured questionnaires. Anthropometric assessments and body composition evaluations were conducted using validated equipment. Weight and height were measured using a digital scale and stadiometer, respectively. Body mass index (BMI) (Kg/m^2) was calculated and categorised per WHO 2001 guidelines as: Underweight ($<18.5 \text{ Kg}/\text{m}^2$), Normal ($18.5\text{--}24.99 \text{ Kg}/\text{m}^2$), Overweight ($25\text{--}29.99 \text{ Kg}/\text{m}^2$), and Obese ($\geq 30 \text{ Kg}/\text{m}^2$).¹⁰ Waist circumference (WC) was measured with a tape, with cut-off values of $\geq 90 \text{ Cm}$ for males indicating central obesity.¹¹

Body composition, including total body fat (TBF) and visceral body fat (VBF), was assessed using an Omron BF-508 body composition monitor.¹² Fasting blood glucose (FBG) levels were measured using a glucometer via the finger-prick. The blood glucose levels were categorized into two groups: normal (below $100 \text{ mg}/\text{dL}$) and hyperglycaemia (above $100 \text{ mg}/\text{dL}$).¹³

Diet quality was assessed using the validated Diet Quality Index (DQI)¹⁴ which evaluates intake across five food groups: vegetables, fruits, nuts and seeds, legumes, and animal foods. A maximum score of 5 indicates consumption of all groups. Additional scores included: non-communicable disease (NCD) Protect Score (0–9): Reflects adherence to global dietary recommendations (GDR) for non-communicable disease prevention, emphasizing protective food groups. Non-communicable disease (NCD) Risk Score (0–9): Measures intake of unhealthy food groups, with higher scores indicating greater consumption. Global Dietary Recommendations (GDR) Score (0–18): Combines protective and risky dietary factors, with scores ≥ 10 indicating adherence.

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ), with MET values categorized as low ($<600 \text{ MET-min}/\text{week}$), moderate ($600\text{--}1500 \text{ MET-min}/\text{week}$), or high ($>1500 \text{ MET-min}/\text{week}$).¹⁵ Sleep quality was

evaluated using the Pittsburgh Sleep Quality Index (PSQI), with scores >5 indicating poor sleep quality.¹⁶

Data were analysed using SPSS-20 and Microsoft Excel. Mean \pm SD and frequencies and percentages were calculated for relevant variables. Independent *t*-tests assessed mean differences, and chi-square tests examined associations between categorical variables. Linear regression identified predictors of glycaemic status, with results presented as β -coefficients and 95% CI with $p \leq 0.05$ taken as statistically significant.

RESULTS

The mean age of total 243 participants was 38.5 ± 6.6 years. Educational levels varied, with 118 (48.6%) holding university degrees. Majority (222, 91.4%) were married, with an average age at marriage as 26.1 ± 5.3 years. Most respondents (214, 88.1%) were non-smokers, and 119 (49%) resided in rural areas. The reported average monthly income was PKR 63,400, with 131 (53.9%) living in joint families. Participants had an average family size of 11 ± 4.9 members and an average of 4 children. Mean job duration was 12 ± 7 years. (Table-1).

Hyperglycaemic individuals exhibited significantly higher weight, body mass index, waist circumference, body fat percentage, and visceral fat levels. The prevalence of overweight/obesity and central obesity among hyperglycaemic individuals was 52 (100%) and 41 (78.8%), respectively. The mean fasting blood glucose (FBG) level was $99.6 \pm 42.9 \text{ mg}/\text{dL}$. This group also reported lower physical activity levels (PAL-MET) and poorer sleep quality, as indicated by higher Pittsburgh Sleep Quality Index (PSQI) scores. The percentage of disturbed sleep ($\text{PSQI} > 5$) was significantly higher (78.4%) in the hyperglycaemic group compared to normal group (35.9%), ($p < 0.001$). (Table-2).

Table-1: Socio demographic characteristics of the university employees

Characteristics		Mean \pm SD/[n (%)]
Age (Years)		38.5 \pm 6.6
Education	Primary or below	44 (18.1)
	SSC/HSSC	81 (33.2)
	University	118 (48.6)
Job duration (Years)		12.0 \pm 7.0
Marital status	Married	222 (91.4)
Age at marriage (Years)		26.1 \pm 5.3
Residence	Rural	119 (49.0)
	Urban	124 (51.0)
Smoking status	Non-smokers	214 (88.1)
Monthly income in thousands (PKR)		63.4 \pm 61
House ownership	Own	200 (82.3)
Family type	Joint	131 (53.9)
Family size		11 \pm 4.9
No. of children in family		4 \pm 1.9

(PKR: Pakistani rupees, SSC: Secondary School Certificate, HSSC: Higher Secondary School Certificate)

Table-2: Physical health status by glycaemic status

Indicators	Glycaemic status Mean±SD/[n (%)]		p
	Normal	Hyperglycaemic	
Weight (Kg)	70.6±14.3	88.2±19.3	<0.0001
Height (Cm)	167.8±6.6	168.0±6.9	NS
BMI	24.9±4.5	30.5±7.0	<0.0001
Nutrition Status (based on BMI)			
Normal	124 (62.6)	0	<0.0001
Overweight/Obese	74 (37.4)	52 (100)	
Waist circumference (Cm)	90.7±11.4	100.0±11.5	<0.0001
Central Obesity Status (based on Waist circumference)			
Normal	108 (54.5)	11 (21.2)	<0.0001
Central obesity	90 (45.5)	41 (78.8)	
Total body fat	22.2± 7.2	29.4± 7.1	<0.0001
Visceral fat	8.3±4.1	13.6± 6.0	<0.0001
Fasting blood glucose	78.8±6.5 192 (79)	177.6±30.0 51 (21)	<0.001
PAL-MET	1090.7±780.7	638.9± 405.2	<0.0001
PSQI-Score	4.7±2.1	5.4±1.1	<0.021
Physical Activity Level (based on MET)			
Low level activity<600	78 (40.6)	41 (80.4)	<0.001
Moderate activity 600–1500	62 (32.3)	8 (15.7)	
High level activity>3000	52 (27.1)	2 (3.9)	
Sleep Quality			
Normal (PSQI≤5)	123 (64.1)	11 (21.6)	<0.001
Disturbed Sleep (PSQI>5)	69 (35.9)	40 (78.4)	

Age, job duration, family size, body mass index, waist circumference, total body fat, visceral fat, and physical activity levels were positively related with FBG levels ($p<0.05$). Dietary factors, including adherence to all 5 food groups, NCD Protect scores, GDR, and fibre intake, demonstrated protective effects ($p<0.05$). Notably, the non-communicable disease NCD risk score showed a positive association with hyperglycaemia risk ($p<0.05$). (Table-3).

Table-3: Unadjusted determinants of fasting blood glucose (Unadjusted analysis)

Determinants	β-coefficients (95% CI)
Body mass index (BMI)	3.66 (2.82–4.50)***
Waist circumference	1.35 (0.94–1.77)*
Visceral fat	3.99 (3.05–4.94)***
Total body fat	2.69 (2.05–3.32)***
Age	1.42 (0.63–2.22)*
Job duration	1.19 (0.43–1.94)*
Family size	1.84 (0.77–2.91)**
All five food groups	-11.2 (-15.3– -7.12)***
NCD Protect score	-3.10 (-5.47– -0.72)*
NCD risk score	3.13 (1.56–4.70)***
GDR	-3.61 (-4.98– -2.24)***
Fiber	-0.47 (-0.80– -0.14)**
PAL	-0.01 (-0.02– -0.00)***

(* $p<0.05$, ** $p<0.01$, *** $p<0.001$)

BMI ($\beta=1.799$, $p<0.01$) and total body fat ($\beta=1.630$, $p<0.001$) were positively associated with fasting blood glucose, while consumption of all five food groups ($\beta=-7.657$, $p<0.001$) had a protective effect. In contrast, the unadjusted analysis showed a broader range of factors associated with fasting blood glucose, including age, job duration, family size, waist circumference, visceral fat, and physical activity levels, as well as dietary factors like NCD Protect scores, GDR, and fibre intake. (Table-4).

Table-4: Adjusted determinants of fasting blood glucose (Adjusted Analysis)

Determinants	β-coefficients (95% CI)
Age	0.231(-0.52–0.98)
Family size	0.479 (-0.53–1.49)
Body mass index (BMI)	1.799 (0.64–2.95)**
Total body fat	1.630 (0.79–2.46)***
All five food groups	-7.657 (-11.65–-3.66)***
NCD risk score	0.550 (-0.93–2.03)
PAL	0.004 (-0.00–0.01)

(** $p<0.01$, *** $p<0.001$)

DISCUSSION

Our study confirms that socio-demographic factors like age, job duration, and large family size are strongly associated with elevated FBG levels, consistent with previous work.^{17,18} Biological mechanisms underlying hyperglycaemia involve complex interactions between insulin resistance, pancreatic beta-cell dysfunction, and lifestyle factors. Adiposity, particularly central obesity, contributes to insulin resistance by promoting chronic inflammation and altering adipokine secretion leading to impaired glucose uptake in skeletal muscle and increased glucose production in the liver, ultimately resulting in hyperglycaemia.¹⁹ University employees, given their sedentary lifestyles and unhealthy dietary habits, are particularly susceptible to glycaemic dysregulation.^{20,21} Lower physical activity levels and suboptimal sleep quality exacerbate risk of hyperglycaemia.^{22,23} Consistent with previous work²⁴, BMI, TBF, and VF were the significant predictors of elevated FBG. Excess adiposity is a primary driver of insulin resistance, a precursor to hyperglycaemia.²⁵ Effective management of these parameters is crucial for glycaemic control.

Recent studies have highlighted the role of dietary factors in modulating insulin sensitivity and glucose metabolism. Diets rich in fruits, vegetables, and whole grains, which are high in fibre and antioxidants, have been shown to enhance insulin sensitivity and reduce inflammation. Dietary adherence to all five food groups and higher fibre intake were inversely associated with fasting blood glucose levels, highlighting the protective role of a balanced diet. The fibre content in these diets can slow down glucose absorption, reducing the peak blood glucose levels and insulin demand.^{26,27} These findings underscore the importance of dietary quality and lifestyle interventions in mitigating hyperglycaemia risk.

Our findings support the development of targeted interventions emphasizing weight management, dietary improvements, and physical activity. These strategies can effectively address hyperglycaemia and associated metabolic risks. The role of dietary diversity, particularly through adherence to GDR and NCD Protect scores, further underscores the need for comprehensive public health initiatives aimed at promoting healthier lifestyles.

CONCLUSION

The study highlights the significant influence of anthropometric factors, particularly BMI and total body fat, on fasting blood glucose levels. Dietary diversity and fibre intake serve as protective factors against hyperglycaemia. These findings emphasize the importance of dietary and lifestyle interventions in glycaemic regulation, suggesting that strategies focused on weight reduction, balanced nutrition, and increased physical activity can effectively reduce the burden of hyperglycaemia.

ACKNOWLEDGMENT

We thank the University of Agriculture, Peshawar, and Khyber Medical University, Peshawar, for providing logistical support for this research. We also thank the university employees who participated in this study.

REFERENCES

- Basiri R, Seidu B, Cheskin LJ. Key nutrients for optimal blood glucose control and mental health in individuals with diabetes: A review of the evidence. *Nutrients* 2023;15(18):3929.
- Varalakshmi D, Rekha K. The impact of exercise on glycemic control, cardiorespiratory, BMI and quality of life in postmenopausal diabetic women: a comprehensive review. *Rom J Diabetes Nutr Metab Dis* 2024;31(1):82–92.
- Hantzidiamantis PJ, Awosika AO, Lappin SL. (Eds). *Physiology, glucose*. StatPearls [Internet]: StatPearls Publishing; 2024.
- Sharif S, Manzoor F, Khan F, Naz S. Prevalence of diabetic retinopathy in diabetic subjects visiting diabetic centers of Lahore, Pakistan: Prevalence of diabetic retinopathy in diabetic subjects. *Pak J Health Sci* 2024;5(2):65–9.
- Mathu Reka S, Vijayanchali SS, Lakshmanan S, Priya MV, Kesavaraj G, Samuel M. A brief narrative review on prevalence of diabetes in Tamil Nadu. *Texila Int J Public Health* 2024;24(5):012.
- Papakonstantinou E, Oikonomou C, Nychas G, Dimitriadis GD. Effects of diet, lifestyle, chrononutrition and alternative dietary interventions on postprandial glycemia and insulin resistance. *Nutrients* 2022;14(4):823.
- Kavouras SA, Panagiotakos DB, Pitsavos C, Chrysohoou C, Anastasiou CA, Lentzas Y, *et al*. Physical activity, obesity status, and glycemic control: the ATTICA study. *Med Sci Sports Exerc* 2007;39(4):606–11.
- Alhyas L, McKay A, Balasanthiran A, Majeed A. Prevalences of overweight, obesity, hyperglycaemia, hypertension and dyslipidaemia in the Gulf: systematic review. *JRSM Short Rep* 2011;2(7):55.
- Mohajan D, Mohajan HK. Obesity and its related diseases: a new escalating alarming in global health. *J Innov Med Res* 2023;2(3):12–23.
- Çakmur H, (Ed). *Body Mass Index: Overweight, Normal Weight, Underweight*. BoD—Books on Demand; 2023.
- Bener A, Yousafzai MT, Darwish S, Al-Hamaq AO, Nasralla EA, Abdul-Ghani M. Obesity index that better predict metabolic syndrome: body mass index, waist circumference, waist hip ratio, or waist height ratio. *J Obes* 2013;2013(1):269038.
- Miklshanskaya SV, Orlovsky A, Chigineva VV, Karlova NA, Muksinova MD, Mazur NA. Assessment of visceral adipose tissue in patients with coronary artery disease using bioelectrical impedance analysis. *Russ J Cardiol* 2022;27(1):4629.
- Yeo YT. The relationship between sugary-sweetened beverages (SSB) intake, anthropometric indices and fasting blood glucose (FBG) level among male and female students from Universiti Tunku Abdul Rahman (UTAR) Kampar: (BS (H) Project Report) UTAR; 2023.
- Tur JA, Romaguera D, Pons A. The Diet Quality Index-International (DQI-I): is it a useful tool to evaluate the quality of the Mediterranean diet? *Br J Nutr* 2005;93(3):369–76.
- Bergier M, Bergier B. Level of physical activity among persons from Independent Cultural Centers according to the IPAQ classification. *Cent Eur J Sport Sci Med* 2021;36(4):37–44.
- Carpenter JS, Andrykowski MA. Psychometric evaluation of the Pittsburgh sleep quality index. *J Psychosom Res* 1998;45(1):5–13.
- Ogaji DS. Book of Abstracts of Papers Presented at the 18th Annual Scientific Conference of the National Postgraduate Medical College of Nigeria, Port Harcourt 2024 (15–21 September 2024). *Niger Postgrad Med J* 2024;31(4):353–409.
- Cárdenas L, Vallbona C, Baker S, Yusim S. Adult onset diabetes mellitus: glycemic control and family function. *Am J Med Sci* 1987;293(1):28–33.
- Bergman RN, Van Citters GW, Mittelman SD, Dea MK, Hamilton-Wessler M, Kim SP, *et al*. Central role of the adipocyte in the metabolic syndrome. *J Investig Med* 2001;49(1):119–26.
- Ho LJ, Sheu WH, Lo SH, Yeh YP, Hwu CM, Huang CN, *et al*. Unhealthy lifestyle associated with increased risk of macro-and micro-vascular comorbidities in patients with long-duration type 2 diabetes: results from the Taiwan Diabetes Registry. *Diabetol Metab Syndr* 2023;15(1):38.
- Taghavi F, Rahban M, Moosavi-Movahedi AA. Lifestyle in the regulation of diabetic disorders. In: *Rationality and Scientific Lifestyle for Health*. Cham: Springer International Publishing; 2021.p. 129–53.
- Alsudairy NM, Kariri AN, Alghamdi OK, Aljohani LMM, Alahmadi SFM, Abu Shabib FKF, *et al*. Quality of sleep and its effect on glycemic control. *J Adv Zool* 2024;45(1):250–6.
- Reutrakul S, Punjabi NM, Van Cauter E. Impact of sleep and circadian disturbances on glucose metabolism and type 2 diabetes. In: Cowie CC, Casagrande SS, Menke A, Cissell MA, Eberhardt MS, Meigs JB, *et al*. (Eds). In: *Diabetes in America*. 3rd ed. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases (US); 2018. Chapter 25.
- Abdelhamed MH, Salah S, Alqudsi KK, Jan MM, Alahdal DK, Alfarfi SA, *et al*. Indices of insulin resistance and adiposity can detect obesity-related morbidity in pediatrics. *Saudi Med J* 2022;43(2):161–8.
- Kidwai SS, Bashir F, Nageen A, Munir S, Ara J. Visceral adiposity: a major predictor in diabetes and hypertension. *J Obes Weight Loss* 2017;2(1):100007.
- Mirabelli M, Chiefari E, Arcidiacono B, Corigliano DM, Brunetti FS, Maggisano V, *et al*. Mediterranean diet nutrients to turn the tide against insulin resistance and related diseases. *Nutrients* 2020;12(4):1066.
- Schwingshackl L, Schwedhelm C, Galbete C, Hoffmann G. Adherence to Mediterranean diet and risk of cancer: an updated systematic review and meta-analysis. *Nutrients* 2017;9(10):1063.

Address for Correspondence:

Anosha Khan Shafee, Research Assistant, PKNC KP, Project and Facilitation Centre Coordinator BNP Project, Peshawar, Pakistan. Cell: +92-313-0196569

Email: anoshashafee123@gmail.com

Received: 13 Apr 2025

Reviewed: 5 Aug 2025

Accepted: 7 Sep 2025

Contribution of Authors:

AKS: Concept, Methodology, Data collection and analysis

ZUD: Overall supervision

MI: Data collection

AA: Data collection

MN: Data collection

MS: Data collection

MKS: Writing, review, editing

SS: Data collection

Conflict of Interest: None to declare, **Funding:** None received