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*Original Article*

# Impact of Diet and Lifestyle on Obesity and Related Diseases including Cardiovascular and Renal Diseases in Pakistan

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**Abstract: Background:** Obesity is increasing in Pakistan due to poor dietary habits, sedentary lifestyles, and lack of awareness. These trends contribute significantly to the growing burden of non-communicable diseases, particularly cardiovascular and renal disorders. Therefore, this study aimed to evaluate the impact of diet and lifestyle on obesity and related diseases, including cardiovascular and renal diseases, in Pakistan. **Study design and setting:** This research employed a cross-sectional study design and was conducted in the outpatient departments of government hospitals, such as Jinnah and Mayo Hospital, Lahore. **Methods:** Data were collected from 400 adults aged 18 and above using a structured, pre-tested questionnaire and clinical assessments. Participants were selected through a multistage sampling technique. The questionnaire assessed diet, physical activity, smoking, alcohol consumption, sleep patterns, stress levels, and family history. Clinical data, including BMI, blood pressure, and waist circumference, were recorded, and available lab results (lipid profile, glucose, and kidney function) were reviewed. SPSS version 25 was used for data analysis. Descriptive and bivariate statistics were applied, with significance set at $p < 0.05$. **Results:** The findings revealed that obesity, cardiovascular disease, and renal disease were significantly associated with multiple modifiable risk factors. Processed food intake, physical inactivity, and comorbidities such as hypertension and diabetes showed strong associations. **Conclusion:** The study emphasizes the urgent need for public health interventions in Pakistan focused on lifestyle modifications to curb obesity and its complications. Early screening, education, and targeted policies can improve long-term outcomes and reduce the burden of cardiovascular and renal diseases.

**Keywords:** Obesity, Cardiovascular Disease, Renal Disease, Lifestyle Factors, Non-Communicable Diseases, Pakistan



## 1. Introduction

According to the World Health Organization (WHO), obesity is defined as having a Body Mass Index (BMI) of 30 or above. However, a subset of individuals categorized as obese exhibit a paradoxical phenotype known as metabolically healthy obesity (MHO). It is characterized by the absence of conventional metabolic complications such as dyslipidemia, insulin resistance, hypertension, and systemic inflammation. The global rise in childhood and adolescent obesity has sparked growing concern due to its well-established association with an increased risk of developing cardiometabolic diseases. In Pakistan, various studies estimate that 25% or more of the population is overweight or obese. This phenomenon challenges the traditional understanding of obesity as a uniformly detrimental condition and has important implications for early identification, risk stratification, and targeted intervention in youth population (Siddiqui et al., 2018). Adolescence, marked by rapid physiological and behavioral changes, represents a critical window for the development or prevention of metabolic disorders. Understanding the factors that distinguish metabolically healthy from unhealthy obesity in this age group is essential for refining clinical definitions of MHO and guiding public health strategies (Jawad et al., 2020). Previous studies have highlighted the potential roles of anthropometric measurements, biochemical markers, and lifestyle factors such as diet, physical activity, sleep, and screen time in shaping metabolic outcomes among obese adolescents (Asif et al., 2018).

The interplay between these determinants remains incompletely understood. Recent findings suggest that while some anthropometric and biochemical indicators are consistently associated with metabolic health, lifestyle variables may exert a more modest or context-dependent

influence (Asif et al., 2021). Notably, uric acid levels appear to be a distinguishing factor when abdominal obesity is not present, indicating the potential importance of visceral adiposity-independent pathways. Gender-specific patterns have also emerged, with differing lifestyle and dietary contributors to metabolic health between boys and girls (Ghori et al., 2025).

Obesity is a key contributor to several non-communicable diseases, especially cardiovascular and renal diseases. Obesity leads to metabolic changes, insulin resistance, and hypertension, all major risk factors for cardiovascular diseases (CVDs) and chronic kidney disease (CKD). Chronic kidney disease (CKD) is a growing global health issue, defined by either evidence of kidney damage or an estimated glomerular filtration rate (eGFR) below 60 ml/min/1.73 m² lasting for more than three months, regardless of the underlying cause (Whaley-Connell & Sowers, 2017). Affecting an estimated 10.6% to 13.4% of the global population, CKD's prevalence is increasing, particularly in low- and middle-income countries. Alarmingly, fewer than 5% of individuals with early-stage CKD are aware of their condition (Dhawan & Sharma, 2020).

In 2017, nearly 700 million people were affected worldwide, with more cases than those seen in diabetes, asthma, or depressive disorders. The disease is progressive and leads to irreversible nephron loss, culminating in end-stage renal disease (ESRD), which requires dialysis or kidney transplantation and significantly increases the risk of early mortality (7). Hypertension and diabetes mellitus are the leading causes of CKD, though genetic predisposition, sickle cell anemia, lifestyle factors, and the use of nephrotoxic drugs may also contribute. The condition is linked with numerous complications such as cardiovascular disease, cognitive decline, electrolyte imbalances, metabolic acidosis, anemia, and bone mineral disorders, among others. Patients with CKD are at a substantially higher risk of hospitalization, have diminished quality of life, and face a mortality rate over 100 times higher than the general population (Lin et al., 2018). By 2030, the number of individuals needing renal replacement therapy is projected to double, highlighting the urgent need for increased awareness, early detection, and prevention strategies (Lin et al., 2018).

Coronary heart disease (CHD) arises from a complex interaction between genetic predisposition and environmental influences. Among these, modifiable lifestyle factors, particularly diet, play a major role in increasing the risk of CHD across populations. While cigarette smoking, obesity, and lack of physical activity are well-established contributors, the influence of specific dietary components has only gained clarity in recent years (Oluyombo et al., 2022). Research now emphasizes that the quality of fats and carbohydrates consumed matters more than their quantity in determining CHD risk. Strong evidence from epidemiological studies and clinical trials suggests that diets rich in fruits, vegetables, whole grains, and nuts are associated with a lower risk of CHD (Katta et al., 2021). Adopting such dietary patterns, along with maintaining a healthy lifestyle, can significantly reduce disease burden. Moreover, when necessary, combining lifestyle changes with medications to control blood pressure and lipid levels can prevent a substantial proportion of CHD events. These findings highlight the powerful impact of preventive strategies focused on diet and lifestyle in reducing the global burden of coronary heart disease (Katta et al., 2021).

## 2. Materials and Methods

This research employs a cross-sectional study design to explore the impact of diet and lifestyle on obesity and its associated diseases, particularly cardiovascular and renal conditions. The study was conducted in outpatient departments of government hospitals and specialized clinics, where a diverse patient population regularly seeks medical advice. These settings were selected to ensure representation across various age groups, socioeconomic backgrounds, and health statuses, providing a comprehensive overview of the relationship between dietary and lifestyle habits and the development of obesity-related health conditions. Data for the study were primarily quantitative in nature, gathered through structured questionnaires and clinical assessments. The study population consisted of adults aged 18 years and above who were either overweight or obese, as defined by body mass index (BMI) criteria. Participants with a known history of cardiovascular or renal diseases were included to examine correlations with obesity. Exclusion criteria involved individuals who were pregnant, those diagnosed with cancer or other chronic wasting diseases, and those unwilling to give informed consent.

A sample size of 400 participants was calculated using standard statistical formulas to ensure adequate power and precision. A multistage sampling technique was used: first, healthcare facilities were selected purposively based on accessibility and patient load, followed by systematic random sampling of eligible participants from outpatient attendance registers. Data collection tools included a pre-tested, structured questionnaire designed to assess dietary patterns, physical activity levels, smoking and alcohol consumption, sleep habits, and stress levels. It also included sections

on past medical history and family history of obesity-related diseases. Clinical measurements such as height, weight, blood pressure, and waist circumference were recorded by trained personnel. Laboratory reports of lipid profiles, blood glucose, and kidney function tests were also reviewed, where available, to validate the presence of cardiovascular or renal complications.

The questionnaire was pilot-tested on a small group of participants (n = 20) from a similar demographic to assess clarity, relevance, and the time required for administration. Based on feedback, minor modifications were made to improve content and flow. The data collection process was carried out by a team of trained data collectors under the supervision of the principal investigator. Participants were first informed about the purpose and scope of the study and were enrolled only after obtaining written informed consent. Privacy and confidentiality were maintained throughout, and participants were assured that their responses would be used solely for research purposes. Ethical approval for the study was obtained from the institutional review board (IRB), ensuring that all research activities adhered to ethical standards. Data were analyzed using SPSS software version 25. Descriptive statistics such as frequencies, means, and standard deviations were used to summarize the demographic and clinical characteristics of the participants. Quantitative variable was presented in the form of Mean and Standard deviation. Qualitative variables were presented in the form of frequency and percentages. Bivariate analyses, employing chi-square test statistics, were conducted to examine the associations between lifestyle factors and obesity-related diseases, such as cardiovascular and renal disease. Results were presented in the form of tables and charts, while $p < 0.05$ was considered to be statistically significant.

## 3. Results

The results of this study examine the relationship between lifestyle factors and health outcomes, specifically obesity, cardiovascular disease, and renal disease. Key variables like age, gender, diet, and physical activity were analyzed. Significant associations were found between these factors and the health outcomes. These findings contribute to the understanding of the factors affecting these diseases.

**Table 1: Sociodemographic characteristics of patients (N=400)**

| Variable | (M± SD) |
|---|---|
| Age | 43.4 ± 1.2 |
| Gender | **n (%)** |
| Male | 180 (45.0%) |
| Female | 220 (55.0%) |
| Marital status | |
| Single | 120 (30.0%) |
| Married | 250 (62.5%) |
| Divorced | 20 (5.0%) |
| Widowed | 10 (2.5%) |
| Education level | |
| No formal education | 40 (10.0%) |
| Primary | 60 (15.0%) |
| Secondary | 120 (30.0%) |
| College/university | 130 (32.5%) |
| Postgraduate | 50 (12.5%) |
| Employment status | |
| Unemployed | 50 (12.5%) |
| Employed (office) | 100 (25.0%) |
| Employed (manual) | 80 (20.0%) |
| Self employed | 60 (15.0%) |
| Student | 70 (17.5%) |
| Retired | 40 (10.0%) |

The study included 400 patients in Pakistan with an average age of about 43 years. As indicated in Table 1, 45% were men and 55% were women. Most participants were married (62.5%), while 30% were single, 5% divorced, and 2.5% widowed. In terms of education, 10% had no formal schooling, 15% completed primary level, 30% reached secondary level, 32.5% attended college or

university, and 12.5% had postgraduate degrees. Regarding employment, 12.5% were unemployed, 25% worked in office jobs, 20% in manual labor, 15% were self-employed, 17.5% were students, and 10% were retired.

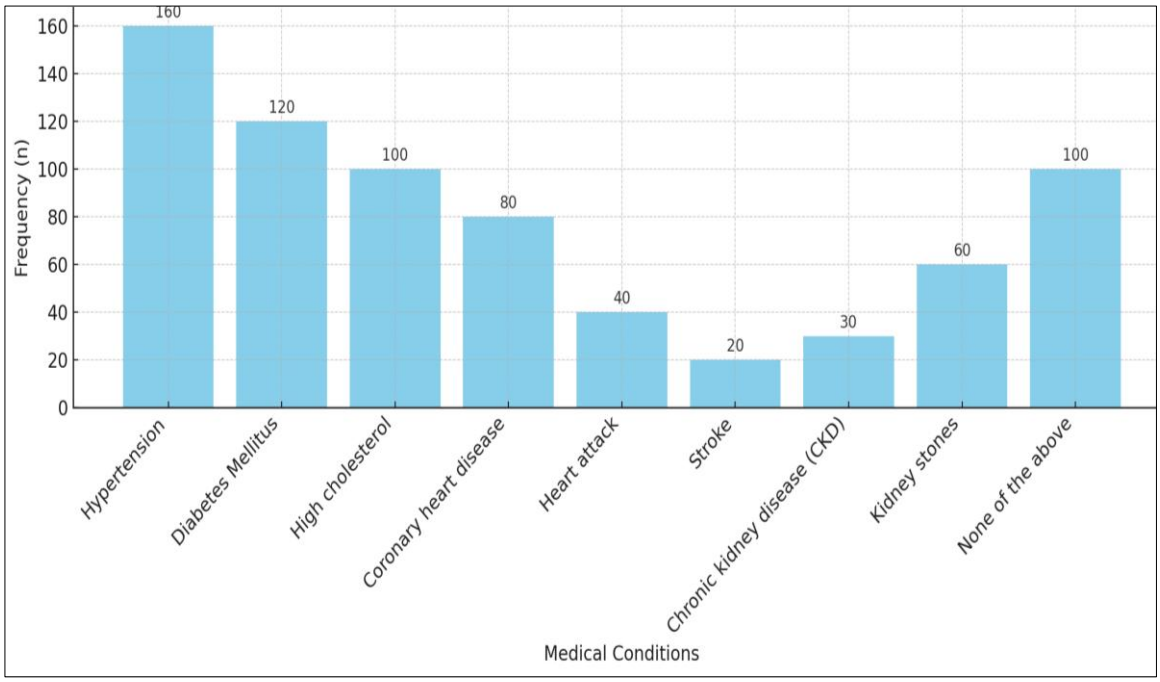


***Figure 1: Medical history of study participants***

Figure 1 illustrates that the study identified several medical conditions among the patients. Hypertension was the most common, affecting 160 patients (40%), followed by Diabetes Mellitus in 120 patients (30%) and high cholesterol in 100 patients (25%). According to figure 1 Coronary heart disease was found in 80 patients (20%), while 40 patients (10%) reported having a heart attack. Stroke was less common, reported by 20 patients (5%), and chronic kidney disease was seen in 30 patients (7.5%). Kidney stones were present in 60 patients (15%). Notably, 100 patients (25%) did not report any of these conditions.

The anthropometric measurements of patients showed a mean height of 164.3 ± 9.7 cm, mean weight of 71.1 ± 13.2 kg, mean BMI of 26.5 ± 4.8 kg/m², and mean waist circumference of 93.2 ± 11.6 cm. Blood pressure results indicated an average systolic BP of 123.8 ± 16.5 mmHg and diastolic BP of 83.6 ± 10.3 mmHg. For blood sugar, the mean value was 110.2 ± 26.4 mg/dL. Lipid profile analysis revealed a mean total cholesterol of 192.5 ± 28.1 mg/dl, LDL cholesterol of 118.2 ± 31.5 mg/dl, HDL cholesterol of 44.2 ± 10.8 mg/dl, and triglycerides of 153.2 ± 31.6 mg/dl. Renal function assessment showed a mean serum creatinine of 0.9 ± 0.2 mg/dL and an estimated glomerular filtration rate (eGFR) of 89.7 ± 12.0 ml/min/1.73 m².

**Table 2: Dietary Patterns and Frequency of Consumption of Different Food Items of patients participated in study conducted in Pakistan**

| Food item | Daily n (%) | 2–3 times/week n (%) | Occasionally n (%) | Never n (%) |
|---|---|---|---|---|
| Fruits | 140 (35.0) | 160 (40.0) | 80 (20) | 20 (5) |
| Vegetables | 200 (50.0) | 120 (30.0) | 60 (15) | 20 (5) |
| Whole grains | 104 (26) | 144 (36) | 116 (29) | 36 (9) |
| Fried/fast foods | 60 (15) | 160 (40) | 132 (33) | 48 (12) |
| Sugar drinks | 80 (20) | 120 (30) | 148 (37) | 52 (13) |
| Red meat | 76 (19) | 116 (29) | 152 (38) | 56 (14) |
| Processed meat | 40 (10) | 100 (25) | 160 (40) | 100 (25) |
| Dairy products | 160 (40) | 136 (34) | 84 (21) | 40 (5) |
| Nuts/seeds | 120 (30) | 124 (31) | 116 (29.0) | 40 (10) |
| Fish | 60 (15) | 152 (38) | 144 (36) | 44 (11) |

The data of Table 2 showed that 35% consumed fruits daily, 40% ate them 2–3 times per week, 20% occasionally, and 5% never. Vegetables were eaten daily by 50%, 30% consumed them 2–3 times per week, 15% occasionally, and 5% never. Whole grains were consumed daily by 26%, while 36% ate them 2–3 times per week, 29% occasionally, and 9% never. Unhealthy options such as fried or fast foods were consumed daily by 15%, 40% ate them 2–3 times per week, 33% occasionally, and 12% never. Similarly, sugar-sweetened drinks were taken daily by 20%, 30% consumed them 2–3 times weekly, 37% occasionally, and 13% never. Red meat consumption was reported daily by 19%, 29% ate it 2–3 times weekly, 38% occasionally, and 14% never. Processed meats were less common, with only 10% eating them daily, 25% consuming them 2–3 times per week, 40% occasionally, and 25% never. In terms of healthier items, dairy products were consumed daily by 40%, nuts and seeds by 30%, and fish by 15%.

**Table 3: Physical Activity Patterns of patients participated in study conducted in Pakistan**

| Variable | n (%) |
|---|---|
| **Regular activity** | |
| Yes | 240 (60.0) |
| No | 160 (40.0) |
| **Type of activity** | |
| Walking | 200 (50.0) |
| Gym/Training | 80 (20.0) |
| Sports | 50 (12.5) |
| Yoga | 30 (7.5) |
| Running/Jogging | 40 (10) |
| **Frequency/Week** | |
| 1-2 days | 82 (20.2) |
| 3-5 days | 118 (29.9) |
| 6-7 days | 41 (10.1) |
| None | 160 (39.8) |
| **Duration** | |
| <15 mins | 42 (10.1) |
| 15-30 | 106 (25.2) |
| 31-60 | 157 (39.8) |
| >60 mins | 100 (24.9) |

The findings on physical activity showed in Table 3 indicates that 60% of patients engaged in regular activity, while 40% did not. Walking was the most common form of exercise (50%), followed by gym/training (20%), sports (12.5%), running/jogging (10%), and yoga (7.5%). Regarding frequency, 20.2% exercised 1–2 days per week, 29.9% for 3–5 days, 10.1% for 6–7 days, while 39.8% reported no exercise at all. In terms of duration, 10.1% exercised for less than 15 minutes, 25.2% for 15–30 minutes, 39.8% for 31–60 minutes, and 24.9% for more than one hour.

**Table 4: Impact of diet and lifestyle on kidney diseases of patients participated in study conducted in Pakistan**

| Variable | Kidney disease Present n (%) | Kidney disease Not present n (%) |
|---|---|---|
| High intake of processed foods | 60 (66.7) | 80 (25.8) |
| Low intake of water (<1.5L/day | 55 (61.1) | 90 (29.0) |
| High red meat consumption | 50 (55.6) | 80 (25.8) |
| High sugary drinks consumption | 40 (44.4) | 60 (19.4) |
| No regular physical activity | 70 (77.8) | 90 (29.0) |
| Overweight/Obese individuals | 65 (72.2) | 110 (35.5) |
| Smoking habit | 30 (33.3) | 40 (12.9) |
| Presence of diabetes or hypertension | 75 (83.3) | 105 (33.9) |
| Impact of diet and lifestyle on cardiovascular diseases | | |
| High intake of fried/fast food | 70 (70.0) | 80 (26.7) |

| | | |
|---|---|---|
| Low fruit and vegetable intake | 65 (65.0) | 90 (30.0) |
| High sugary drinks consumption | 60 (60.0) | 60 (20.0) |
| Low physical activity (none or <2x/week) | 75 (75.0) | 85 (28.3) |
| Overweight/Obese individuals | 80 (80.0) | 95 (31.7) |
| Smoking habit | 40 (40.0) | 30 (10.0) |
| Presence of diabetes or hypertension | 85 (85.0) | 95 (31.7) |
| High cholesterol levels | 70 (70.0) | 30 (10.0) |

The analysis showed that poor diet and lifestyle were strongly linked with kidney disease among patients. Table 4 highlights that the high intake of processed foods was observed in 66.7% of those with kidney disease compared to 25.8% without the condition. Similarly, 61.1% of kidney patients had low water intake (<1.5L/day) versus 29.0% of those without. High red meat consumption was present in 55.6% with kidney disease compared to 25.8% without, while 44.4% with kidney disease consumed sugary drinks compared to 19.4% without. Lack of physical activity was a major factor, reported by 77.8% of kidney patients versus 29.0% without. Additionally, 72.2% of kidney patients were overweight/obese compared to 35.5% without, and 33.3% reported smoking versus 12.9% without. The presence of diabetes or hypertension was also significantly higher among kidney patients (83.3% vs. 33.9%).

A similar pattern was seen with cardiovascular diseases, as shown in Table 4. High intake of fried or fast foods was present in 70.0% of cardiovascular patients versus 26.7% without, and low fruit and vegetable intake in 65.0% compared to 30.0%. High sugary drink consumption was reported in 60.0% versus 20.0%, while 75.0% of cardiovascular patients had low physical activity compared to 28.3% without. Obesity was highly prevalent, with 80.0% of cardiovascular patients overweight/obese compared to 31.7% without. Smoking was reported in 40.0% of cardiovascular patients compared to 10.0% without. Furthermore, 85.0% of cardiovascular patients had diabetes or hypertension versus 31.7% without, and 70.0% had high cholesterol levels compared to only 10.0% without.

**Table 5: Associations Between Independent Variables and Health Conditions (Obesity, Cardiovascular Disease, and Renal Disease)**

| Independent Variable | Obesity (present) | | Cardiovascular Disease (present) | | Renal Disease (present) | |
|---|---|---|---|---|---|---|
| | P value | Chi-square | P value | Chi-square value | P value | Chi-square |
| Age Group | 0.002 | 12.4 | 0.010 | 9.1 | 0.037 | 4.4 |
| Gender | 0.130 | 2.3 | 0.045 | 4.0 | 0.091 | 2.9 |
| Occupation | 0.042 | 4.1 | 0.050 | 3.8 | 0.072 | 3.2 |
| Income Level | 0.008 | 10.0 | 0.020 | 6.2 | 0.029 | 5.0 |
| Diet Pattern | 0.001 | 14.9 | 0.015 | 7.4 | 0.022 | 5.8 |
| Physical Activity | 0.000 | 18.6 | 0.005 | 11.3 | 0.018 | 6.5 |
| Smoking | 0.056 | 3.6 | 0.006 | 10.8 | 0.040 | 4.2 |
| Alcohol Consumption | 0.089 | 3.0 | 0.012 | 8.5 | 0.070 | 3.3 |
| Processed Food Intake | 0.003 | 11.8 | 0.007 | 10.1 | 0.025 | 5.4 |
| Sleep Hours | 0.014 | 7.1 | 0.041 | 4.0 | 0.061 | 3.4 |

The associations between independent variables and health conditions revealed several significant findings, as shown in Table 5. Obesity showed strong associations with age group (p=0.002), income level (p=0.008), diet pattern (p=0.001), physical activity (p<0.001), processed food intake (p=0.003), and sleep hours (p=0.014). Cardiovascular disease was significantly associated with age group (p=0.010), gender (p=0.045), occupation (p=0.050), income level (p=0.020), diet pattern (p=0.015), physical activity (p=0.005), smoking (p=0.006), alcohol consumption (p=0.012), processed food intake (p=0.007), and sleep hours (p=0.041). Renal disease also showed significant links with age group (p=0.037), income level (p=0.029), diet pattern (p=0.022), physical activity (p=0.018), smoking (p=0.040), and processed food intake (p=0.025).

## 4. Discussion

The present study in Pakistan explored the sociodemographic characteristics, lifestyle behaviours, and their associations with obesity, cardiovascular disease (CVD), and renal disease. When compared with findings from international studies, a mixture of similarities and context-specific differences emerged, reflecting global health trends as well as region-specific challenges in managing non-communicable diseases (NCDs). Our sample had a mean age of 43.4 years, and females constituted 55% of participants. These demographics are comparable to studies from Brazil and India where the mean age of NCD-affected populations ranged from 40 to 50 years, with females being slightly more represented in urban health surveys. Education and occupation showed strong associations with health outcomes in our study, echoing findings from Germany and China where lower educational attainment was linked to higher chronic disease burden (Shabana et al., 2020). In our context, 10% of participants had no formal education, indicating lower awareness and preventive health behaviors an issue less pronounced in high-income countries (Nijssen et al., 2024).

Dietary patterns in our population reflected a high intake of fast food and sugary beverages and a low intake of fruits and vegetables. This aligns with studies from the US and Saudi Arabia which found that such unhealthy dietary behaviours are associated with increased obesity and cardiometabolic risks (McGowan & Bambra, 2022). The association between processed food intake and renal disease observed in our study is also supported by research from France and Australia showing strong correlations between ultra-processed food consumption and kidney dysfunction (Casperson et al., 2017). Physical inactivity was common, particularly among those with cardiovascular conditions. Only 60% of participants engaged in any regular physical activity, a trend similar to findings from studies in Canada and South Africa, where sedentary lifestyles are prevalent in both urban and peri-urban populations. In our study, 75% of patients with CVD reported inadequate physical activity, comparable to findings from the EPIC study which emphasized physical inactivity as a major contributor to heart disease Werneck AO et al., 2024).

Obesity was observed in 72.2% of individuals with renal disease and 80% of those with cardiovascular disease, slightly higher than global averages reported in NHANES (Hales C et al., 2020) and the Global Burden of Disease study (Feigin & Kinfu, 2017). These figures reflect both the increasing trend of overweight and obesity in low- and middle-income countries and the limited availability of preventive services (Malik & Hu, 2019). Smoking was significantly associated with both renal and cardiovascular conditions. About 40% of CVD patients were smokers, which is in line with findings from large-scale studies in Asia and Europe (Kondo et al., 2019). Although alcohol consumption was less frequent due to cultural norms, its association with kidney and liver complications is well documented in other regional studies. Participants with comorbidities such as diabetes and hypertension had notably higher risks of cardiovascular and renal complications. In our study, 85% of cardiovascular patients and 83.3% of renal patients reported comorbid conditions. This aligns with global studies such as INTERHEART, KDIGO, and other multicenter investigations that highlight the interconnected nature of metabolic disorders (Malik & Hu, 2019).

In conclusion, the findings of our study are largely in agreement with international evidence regarding risk factors and disease outcomes related to obesity, cardiovascular disease, and renal disease. However, the local context marked by lower education, poor diet quality, limited physical activity, and restricted healthcare access appears to exacerbate the burden of these conditions. These results support the urgent need for integrated, context-sensitive interventions, especially those targeting modifiable risk factors, to curb the growing NCD epidemic in Pakistan.

## 5. Conclusion

This study identifies strong associations between lifestyle and sociodemographic factors with renal and cardiovascular diseases in the Pakistani population. Renal disease was significantly linked to poor dietary habits, low physical activity, and comorbidities such as diabetes and hypertension, while cardiovascular disease showed strong ties to obesity, smoking and high intake of processed foods. These patterns mirror global trends and highlight the urgent need for early screening, health education, and behaviour focused interventions. Community-based strategies that address modifiable risk factors can help reduce the burden of both renal and cardiovascular diseases. Strengthening preventive efforts is essential for improving long-term health outcomes in high-risk groups.

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**Data Availability Statement:** Data is available upon reasonable request from the corresponding author

**Conflict of Interest:** The authors declare no conflict of interest.

## References

Asif, M., Aslam, M., & Altaf, S. (2018). Evaluation of anthropometric parameters of central obesity in Pakistani children aged 5–12 years, using receiver operating characteristic (ROC) analysis. *Journal of Pediatric Endocrinology and Metabolism*, *31*(9), 971–977. https://doi.org/10.1515/jpem-2018-0193

Asif, M., Aslam, M., Qasim, M., Altaf, S., Ismail, A., & Ali, H. (2021). A dataset about anthropometric measurements of the Pakistani children and adolescents using a cross-sectional multi-ethnic anthropometric survey. *Data in Brief*, *34*, 106642. https://doi.org/10.1016/j.dib.2020.106642

Casperson, S. L., Johnson, L., & Roemmich, J. N. (2017). The relative reinforcing value of sweet versus savory snack foods after consumption of sugar- or non-nutritive sweetened beverages. *Appetite*, *112*, 143–149. https://doi.org/10.1016/j.appet.2017.01.028

Dhawan, D., & Sharma, S. (2020). Abdominal Obesity, Adipokines and Non-communicable Diseases. *The Journal of Steroid Biochemistry and Molecular Biology*, *203*(203), 105737. https://doi.org/10.1016/j.jsbmb.2020.105737

Ghori, M. U., Masoud, M. S., Shafique, M., Hussain, M., & Awan, F. R. (2025). Association of obesity traits and uric acid levels with cardiovascular disease in Punjabi patients from Faisalabad, Pakistan. *Acta Cardiologica. Supplementum*, *80*(5), 465–474. https://doi.org/10.1080/00015385.2025.2490369

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2020). Prevalence of Obesity and Severe Obesity Among Adults: United States, 2017-2018. *NCHS Data Brief*, *360*(360), 1–8. https://pubmed.ncbi.nlm.nih.gov/32487284/

Jawed, M., Inam, S., Shah, N., & Shafique, K. (2020). Association of obesity measures and multimorbidity in Pakistan: findings from the IMPACT study. *Public Health*, *180*, 51–56. https://doi.org/10.1016/j.puhe.2019.10.017

Katta, N., Loethen, T., Lavie, C. J., & Alpert, M. A. (2020). Obesity and Coronary Heart Disease: Epidemiology, Pathology, and Coronary Artery Imaging. *Current Problems in Cardiology*, *46*(3), 100655. https://doi.org/10.1016/j.cpcardiol.2020.100655

Kevin M.R. Nijssen, Mensink, R. P., Jogchum Plat, Ivanov, D., Preissl, H., & Joris, P. J. (2024). Mixed nut consumption improves brain insulin sensitivity: a randomized, single-blinded, controlled, crossover trial in older adults with overweight or obesity. ˜ *the œAmerican Journal of Clinical Nutrition*, *119*(2), 314–323. https://doi.org/10.1016/j.ajcnut.2023.12.010

Kondo, T., Nakano, Y., Adachi, S., & Murohara, T. (2019). Effects of Tobacco Smoking on Cardiovascular Disease. *Circulation Journal*, *83*(10), 1980–1985. https://doi.org/10.1253/circj.cj-19-0323

Lin, T.-Y., Liu, J.-S., & Hung, S.-C. (2018). Obesity and risk of end-stage renal disease in patients with chronic kidney disease: a cohort study. *The American Journal of Clinical Nutrition*, *108*(5), 1145–1153. https://doi.org/10.1093/ajcn/nqy200

Malik, V. S., & Hu, F. B. (2019). Sugar-Sweetened Beverages and Cardiometabolic Health: An Update of the Evidence. *Nutrients*, *11*(8), 1840. https://doi.org/10.3390/nu11081840

McGowan, V. J., & Bambra, C. (2022). COVID-19 mortality and deprivation: pandemic, syndemic, and endemic health inequalities. *The Lancet Public Health*, *7*(11), e966–e975. https://doi.org/10.1016/s2468-2667(22)00223-7

Oluyombo, R., Banjo Oguntade, H., Soje, M., Obajolowo, O., & Karim, M. (2022). Obesity and CKD in Sub-Saharan Africa: A Narrative Review. *Kidney Medicine*, *4*(2), 100403. https://doi.org/10.1016/j.xkme.2021.11.001

Shabana, Shahid, S. U., & Sarwar, S. (2020). The abnormal lipid profile in obesity and coronary heart disease (CHD) in Pakistani subjects. *Lipids in Health and Disease*, *19*(1). https://doi.org/10.1186/s12944-020-01248-0

Siddiqui, M., Ayub, H., Hameed, R., Nadeem, M. I., Mohammad, T., Simbak, N., Latif, A., Abubakar, Y., & Baig, A. (2018). Obesity in Pakistan; Current and Future Perceptions. Current Trends in Biomedical Engineering & Biosciences, 17, Article ID: 555958. https://doi.org/10.19080/CTBEB.2018.17.555958

Stanaway, J. D., Afshin, A., Gakidou, E., Lim, S. S., Abate, D., Abate, K. H., Abbafati, C., Abbasi, N., Abbastabar, H., Abd-Allah, F., Abdela, J., Abdelalim, A., Abdollahpour, I., Abdulkader, R. S., Abebe, M., Abebe, Z., Abera, S. F., Abil, O. Z., Abraha, H. N., & Abrham, A. R. (2018). Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, *392*(10159), 1923–1994. https://doi.org/10.1016/s0140-6736(18)32225-6

Werneck, A. O., Steele, E. M., Delpino, F. M., Lane, M. M., Marx, W., Jacka, F. N., Stubbs, B., Touvier, M., Srour, B., Maria LC. Louzada, Levy, R. B., & Monteiro, C. A. (2024). Adherence to the ultra-processed dietary pattern and risk of depressive outcomes: findings from the NutriNet Brasil cohort study and an updated systematic review and meta-analysis. *Clinical Nutrition*, *43*(5), 1190–1199. https://doi.org/10.1016/j.clnu.2024.03.028

Whaley-Connell, A., & Sowers, J. R. (2017). Obesity and kidney disease: from population to basic science and the search for new therapeutic targets. *Kidney International*, *92*(2), 313–323. https://doi.org/10.1016/j.kint.2016.12.034