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Original article

The prevalence of physiological non-communicable diseases risk factors among Black Africans in peri-urban community In South Africa

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ABSTRACT

Background: Non-communicable diseases (NCDs) are chronic, non-transmissible conditions, with cardiovascular diseases (CVDs), cancer, chronic obstructive pulmonary disease (COPD), and type 2 diabetes mellitus (T2DM) accounting for 80 % of NCD-related deaths. Their prevalence and associated risk factors vary across populations based on lifestyle, environment, ethnicity, and gender. Urbanization influences physical activity levels and increases exposure to tobacco, alcohol, and processed foods. This study examined selected NCD risk factors among males ($n = 50$) and females ($n = 50$) in the peri-urban community of KwaDlangezwa.

Methods: A cross-sectional study was conducted using the WHO STEPwise approach. Data collection followed three steps: (1) sociodemographic and health behaviour assessments, (2) anthropometric measurements, and (3) blood parameter evaluations. Statistical analyses included descriptive statistics and Fisher's exact test for categorical associations. Variables assessed included body mass (BM), waist-to-hip ratio (WHR), blood pressure (BP), total cholesterol (TC), and glucose levels.

Results: Significant gender differences emerged: males had higher systolic blood pressure (126.28 ± 15.01 mmHg vs. 114.32 ± 22.02 mmHg, $p = 0.000$) and WHR (0.80 ± 0.07 vs. 0.74 ± 0.06, $p = 0.000$), while females exhibited higher total cholesterol (3.26 ± 0.65 mmol/L vs. 2.90 ± 0.53 mmol/L, $p = 0.000$). Key risk factors included overweight/obesity (38 %), hypertension (12 %), and high waist circumference (21 %), with overweight more prevalent among females (46 % vs. 30 %) and younger individuals ($\leq$25 years, 50.87 %, $p = 0.00$).

Conclusion: These findings underscore the urgent need for gender- and age-sensitive public health interventions aimed at reducing modifiable physiological risk factors, particularly overweight, abdominal obesity, and hypertension, in peri-urban communities.

1. Introduction

Non-communicable diseases (NCDs) are chronic health conditions that are not infectious and cannot be transmitted between individuals. The global burden of NCDs, including cardiovascular diseases (CVDs), chronic obstructive pulmonary diseases (COPDs), and various malignancies, has escalated significantly, with developing nations disproportionately affected. [1] By 2023, NCDs accounted for 74 % of the global disease burden, contributing to 73 % of deaths in low- and middle-income countries. [2] The increasing prevalence of NCDs has been attributed to economic growth in developing nations, alongside shifts in societal behaviours, such as dietary transitions and declining physical activity levels. [3,4] Among NCDs, CVDs have become a critical public health concern due to their severe health implications. [3,5] Hypertension and diabetes are recognized as leading causes of mortality worldwide, the primary modifiable risk factors for CVD, which remains the foremost cause of death globally. [6] In addition, physiological factors such as overweight and obesity, abdominal, dyslipidemia, and impaired glucose regulation are also established contributors to NCD development. These interrelated metabolic disturbances promote systemic inflammation, endothelial dysfunction, insulin resistance, and vascular damage, which collectively increase the risk for CVDs, and other chronic conditions. [5]

NCDs are a major cause of mortality in South Africa, with CVDs contributing to 17.6 % of deaths in 2018, and the overall NCD-related deaths rising by 58.7 % between 1997 and 2018. [7] Certain NCDs have been linked to higher rates of occurrence in certain genders and ethnic

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groups. For example, a South African study found that Asians had significantly higher age-standardized death rates for ischemic heart disease than Coloured, White, and Black South Africans, while Black South Africans had significantly higher age-standardized death rates for diabetes and CVD. [8] Similar to the latter study, ethnic disparities in NCD risk variables were reported in a US study. [9] The study discovered that hypertension was more prevalent in Black Americans than in White Americans, with Mexican Americans having the lowest levels of physical activity, followed by American Indians and American Blacks. [9]

Previous studies indicated that lifestyle changes have made hypertension more prevalent in both rural and urban South African populations. [10] Rural areas across the country were projected to have a prevalence of hypertension of 25 % [11] in 2005, by 2016, this had increased to 38 %. [12] The increasing prevalence of hypertension in South Africa is largely attributed to poor nutrition, sedentary lifestyles, and an aging population. [10] Additionally, several population-based research have discovered that rural Black people have a high prevalence of hypertension. Most risk factors associated with NCDs are modifiable, meaning that their impact can be minimized by reducing their prevalence, thereby lowering the overall lifetime risk. [13] Thus, monitoring the levels of risk factors is critical in NCD control. [14] Although previous research has examined NCD risk factors in certain rural areas of South Africa, there is still a significant gap in studies that systematically evaluate and compare the prevalence of NCDs among adults living in peri-urban regions, particularly Black South Africans. Much of the existing literature focuses on urban populations, where lifestyle shifts due to modernization are well-documented, or on rural communities, where limited healthcare access and economic challenges are key concerns. However, peri-urban areas are uniquely positioned between these two settings, experiencing a mix of urban and rural influences that may contribute to distinct NCD risk factors, such as changes in diet, physical activity levels, and healthcare accessibility. As a result, this study is crucial in addressing this gap by providing a comprehensive assessment of NCD prevalence in peri-urban communities to guide effective and inclusive intervention strategies. This study aimed to assess the prevalence of selected chronic NCD risk factors within the peri-urban community of KwaDlangezwa, located in KwaZulu-Natal, South Africa.

2. Materials and methods

2.1. Study design

A cross-sectional study was conducted using the WHO STEPwise approach on the monitoring of risk factors of NCDs.[2] The WHO STEPwise Approach to Surveillance (STEPS) is a structured method created by the World Health Organization (WHO) to systematically track risk factors for NCDs in an affordable and efficient way. [2] It involves three key phases: survey-based data collection (gathering information on behaviours like smoking, diet, and physical activity), physical assessments (measuring blood pressure, weight, and waist circumference), and biochemical testing (examining blood glucose and cholesterol levels). In the initial phase, data on participants' socio-demographic characteristics and health behaviors were gathered using structured questionnaires with predefined response options to ensure consistency and comparability. The second phase involved objective anthropometric assessments, including measurements of height, weight, waist, and hip circumferences, along with blood pressure evaluation. In the final phase, biochemical analyses were conducted to assess blood parameters, specifically total cholesterol levels, providing critical insights into participants' metabolic health.

2.2. Study population

The study targeted Black African male and female adults aged 18 and above residing in the peri-urban community of KwaDlangezwa, KwaZulu-Natal Province, South Africa. Participants aged 18 and older were selected as this marks the legal age of adulthood, a stage where individuals are more likely to make independent lifestyle choices that impact their risk factors for NCDs. A total of 100 participants were included (n = 50 males; n = 50 females). Participants were randomly recruited on a voluntary basis using voluntary sampling. A 1:1 male-to-female ratio was maintained, ensuring equal representation of both genders, with each male participant matched by a female participant. A sample size of 100 was commonly used in similar studies conducted in South Africa, particularly in research assessing NCDs and associated risk factors. [15] The sample size was selected to balance statistical power and feasibility, ensuring adequate data for meaningful analysis while maintaining practical constraints related to time, cost, and participant burden.

The inclusion criteria for this study required participants to be Black African males or females, aged 18 years or older, and residing in Kwa-Dlangezwa within the Vulindlela region of KwaZulu-Natal. Individuals who did not meet these criteria were excluded from the study. Specifically, exclusion was based on age (those younger than 18 years), ethnicity (non-Black African individuals), and residency (those not residing in Kwa-Dlangezwa). This ensures that the study focuses on the target population of Black African adults living in the specified area.

2.3. Data collection

Physiological data collection was conducted in a controlled laboratory setting by the researcher to ensure accuracy and consistency. The laboratory environment was maintained with specific attention to temperature (20–22 °C), humidity (40–60 %), and lighting control. All equipment used for measurement was regularly calibrated according to manufacturer guidelines to maintain precision. Standardized testing protocols were strictly followed to minimize variability, with participants given a 5–10-min resting period prior to data collection to establish stable baseline measurements. The setting was also designed to minimize external distractions that could affect the physiological responses of the participants. This approach adhered to the American College of Sports Medicine (ACSM) guidelines, [16] ensuring reliable and comparable data collection.

2.4. Anthropometric assessment

Anthropometric measurements are widely recognized for their precision in estimating body fat percentage and providing critical insights into overall health and risk stratification. [17] In this study, all anthropometric assessments were conducted by the same trained technician, following standardized protocols outlined by the International Society for the Advancement of Kinanthropometry (ISAK). [18] Body mass (BM) was measured using a Detecto weight scale (Mediotronics (PTY) LTD, USA) while participants wore minimal clothing and no shoes, with results systematically recorded. Stature was assessed using a portable stadiometer (SECA 217, SECA, USA), which comprises a vertical stand and an adjustable headpiece. Body mass index (BMI) was then computed using the standard formula: BMI = weight (kg)/height (m^2). Additionally, the waist-to-hip ratio (WHR) was determined using the formula WHR = waist circumference ÷ hip circumference. Both waist and hip circumferences were measured using a Tonver measuring tape (Holtain Ltd.). [16]

2.5. Hemodynamic assessment

Blood pressure was assessed following a 5-min rest period using the auscultatory method, adhering to the guidelines set by the American College of Sports Medicine. [16] Measurements were taken with a sphygmomanometer and stethoscope (Jiangsu Dengguan Medical Treatment Instrument Co. Ltd.) and recorded on a standardized data sheet. Resting heart rate (HR) was similarly measured after a 5-min rest using a Polar heart rate monitor (Polar F4M BLK, Finland). [19]

2.6. Biochemical assessment

Total cholesterol (TC) and glucose levels were assessed using the Accutrend® Plus Glucose/Cholesterol Monitor (Roche Diagnostics, USA), with results systematically recorded on a data sheet for each participant. Blood samples were obtained through the finger prick method, ensuring minimal discomfort to participants. Following the collection, blood droplets were immediately applied to the Accutrend® Plus reagent strips for immediate analysis. Sampling was conducted while participants remained seated to minimize any external variables that could affect the results, in strict adherence to the Accutrend® GCT system guidelines. The researcher used disposable gloves to maintain hygienic practices and prevent contamination. Furthermore, all equipment was calibrated prior to testing to ensure reliable and consistent results. To minimize risk of infection and ensure safety, all procedures adhered to the South African Bureau of Standards' Code of Practice for the Handling and Disposal of Waste Material in Healthcare Facilities (SANS 10248-1-2008), which includes proper disposal of sharps and waste materials. The entire process was conducted with the utmost care to ensure accuracy and safety throughout the assessment.

2.7. Statistical analysis

Data analysis was conducted using SPSS software version 25. [20] Descriptive statistics were employed to summarize participant characteristics, including means, 95 % confidence intervals (CI), and standard deviations (SD). Associations between categorical variables, including body mass (BM), stature, waist circumference (WC), hip circumference (HC), waist-to-hip ratio (WHR), blood pressure (BP), total cholesterol (TC), and glucose, were assessed using Fisher's exact test. [21] Given the assumption of non-normal data distribution, the Mann-Whitney *U* test was utilized to compare differences in continuous variables. [22] Standard reference cut-off values were applied to interpret biochemical indicator levels, and statistical significance was determined at $p \leq 0.05$.

2.8. Ethical consideration

Ethical approval was obtained from the University of Zululand (UZREC 171110-030). All participants provided written informed consent before enrolling in the study. Participation was entirely voluntary, and individuals were clearly informed that they could withdraw from the study at any time without any impact on their access to care or services. To protect participant confidentiality, all data were anonymized and securely stored, with access restricted to authorized members of the research team.

3. Results

3.1. Physiological risk factors

Among the six physiological risk factors, shown in Table 2, being overweight/obese (38 %) was the most prevalent, followed by having a high waist circumference (21 %). Prevalence of being overweight/obese was significantly higher in the younger age group (≤25 years old; p = 0.00) and higher among females (46 %) compared with males (30 %) though it was not significantly different. Overweight was classified as a body mass index (BMI) between 25 and below 30, while obesity was defined as a BMI of 30 or higher. Waist circumference exhibited a marginally significant difference between males and females (p = 0.07), with a higher prevalence observed among females (30 %). The waist-to-hip ratio (WHR) was calculated, with abnormal values defined as ≥1.0 for men and ≥0.8 for women. Hypertension was diagnosed based on systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg, confirmed through measurements taken on at least two separate occasions (Table 1).

The prevalence of hypertension was higher among males (14 %) compared to females (10 %) and slightly higher among the younger age group (≤25 years old; 12.28 %) though the differences were not significant. The normal fasting plasma glucose is 5.55 mmol/L. All participants recorded healthy cholesterol and glucose levels (Table 1).

Table 1
Distribution of selected continuous variables among participants by gender.

Variable	Category	Mean ± SD	95 % CI	Mann-Whitney *U* test of mean male's vs females
Age (yrs.)	**Total**	25.15 ± 5.98	23.96-26.34	0.760
	Male	24.36 ± 4.32	23.16–25.55	
	Female	25.94 ± 7.23	23.93-27.94	
BMI (kg/m^2)	**Total**	24.93 ± 5.65	23.81-26.05	0.270
	Male	23.96 ± 4.32	22.76-25.15	
	Female	25.90 ± 6.63	24.06–27.73	
Cholesterol (mmol/L)	**Total**	3.08 ± 0.62	2.96-3.20	0.000
	Male	2.90 ± 0.53	2.75-3.04	
	Female	3.26 ± 0.65	3.07-3.44	
Glucose (mmol/L)	**Total**	3.98 ± 1.24	3.74-4.23	0.480
	Male	3.89 ± 0.98	3.61-4.16	
	Female	4.08 ± 1.47	3.67-4.48	
Waist Circumference (cm)	**Total**	77.62 ± 12.33	75.17–80.07	0.330
	Male	78.26 ± 11.65	75.03–81.48	
	Female	76.98 ± 13.05	73.36–80.59	
Hip Circumference (cm)	**Total**	100.07 ± 12.89	97.51–102.63	0.120
	Male	97.66 ± 11.82	94.38–100.93	
	Female	102.48 ± 13.56	98.72–106.23	
WHR	**Total**	0.77 ± 0.07	0.76-0.79	0.000
	Male	0.80 ± 0.07	0.78-0.81	
	Female	0.74 ± 0.06	0.72-0.75	
Systolic BP (mmHg)	**Total**	120.30 ± 19.69	116.39–124.21	0.000
	Male	126.28 ± 15.01	122.11–130.44	
	Female	114.32 ± 22.02	108.21–120.42	
Diastolic BP (mmHg)	**Total**	78.19 ± 13.56	75.50–80.88	0.740
	Male	78.00 ± 12.85	74.44–81.56	
	Female	78.38 ± 14.36	74.39–82.36	

*p ≤ 0.05: Significantly different between males and females. Yrs: years; BMI: body mass index; kg.m^{-2}: kilogrammes per square meter; mmol/L: millimoles per litre; cm: centimetres; WHR: waist-to-hip ratio; BP: blood pressure; mmHg: millimetres mercury; SD: standard deviation; CI: confidence interval.

Table 2
Prevalence of physiological risk factors and their association with gender and age.

Variable	Category	Overweight/Obese (n) %	Hypertensive (n) %	High Total Cholesterol (n) %	High Glucose (n) %	High WC	High WHR
Total	**All**	(38) 38 %	(12) 12 %	(0) 0 %	(0) 0 %	(21) 21 %	(6) 6 %
Gender	**Male (n = 50)**	(15) 30 %	(7) 14 %	(0) 0 %	(0) 0 %	(6) 12 %	(3) 6 %
	Female (n = 50)	(23) 46 %	(5) 10 %	(0) 0 %	(0) 0 %	(15) 30 %	(3) 6 %
	Fisher's exact	0.25	0.77	N/A	N/A	0.07	1.31
Age	**≤25 years (n = 57)**	(29) 50.87 %	(7) 12.28 %	(0) 0 %	(0) 0 %	(13) 22.80 %	(3) 5.26 %
	>25 years (n = 43)	(9) 20.93 %	(5) 11.62 %	(0) 0 %	(0) 0 %	(8) 18.60 %	(3) 6.97 %
	Fisher's exact	0.00[a]	0.77	N/A	N/A	0.38	1.31

[a] $p \leq 0.05$: Significant difference; n: number of participants; N/A: not applicable; WC: waist circumference; WHR: waist-to-hip ratio.

4. Discussion

This study aimed to assess the prevalence of selected chronic non-communicable disease (NCD) risk factors, specifically focusing on overweight/obesity, hypertension, cholesterol, glucose, waist circumference, and waist-to-hip ratio (WHR) among males and females aged 18–45 years in the peri-urban community of KwaDlangezwa, KwaZulu-Natal, South Africa. The results revealed some notable gender differences in the prevalence of these risk factors, which deserve further exploration.

One of the key findings of this study was that the prevalence of overweight/obesity was significantly higher among females (46 %) compared to males (30 %), particularly within the younger age group (≤25 years old; $p = 0.00$). These findings are consistent with South African research, which typically reports a higher prevalence of overweight and obesity in women. [23] Globally, overweight and obesity rates have been rising across different age groups and genders, as indicated by Gregg et al., [24] who found a 31 % prevalence of overweight and obesity among individuals aged 20–74 years in the United States. However, in contrast to global trends, this study observed that waist circumference was higher among males compared to females, with a marginally significant difference ($p = 0.07$), and a higher prevalence observed among females (30 %) in terms of waist-to-hip ratio (WHR).

This divergence from global findings, where women are typically more likely to develop abdominal obesity, may be explained by cultural and lifestyle factors specific to the sample population. Males in this study may be more likely to engage in higher caloric consumption or less physical activity, both contributing to abdominal fat accumulation. Genetic and environmental factors might also contribute to gender-based differences in WC, especially in different socio-cultural contexts. These results indicate that males may be at risk for developing certain NCDs earlier due to their abdominal fat distribution. Moreover, as WC and WHR increase, so does the associated risk for cardiovascular disease, diabetes, and other NCDs. This is particularly relevant as WHR is known to reflect a greater risk for these conditions, with risk thresholds varying by age and gender. Males may reach these thresholds at a younger age than females, given the differing fat distribution patterns and hormonal influences.

Hypertension was another key finding in this study, with males showing a higher prevalence (14 %) compared to females (10 %), and a slightly higher rate observed among the younger age group (≤25 years old; 12.28 %). This finding aligns with other studies indicating a higher prevalence of hypertension in males, [23] yet contrasts with population-based studies in South Africa, which have reported higher hypertension rates among Black South African females compared to males. [12] The differences observed in this study could be attributed to a variety of factors, including socioeconomic and environmental influences that impact blood pressure, particularly in the context of stress, limited healthcare access, and health-promoting behaviours. As documented in previous literature, these factors may contribute to the higher prevalence of elevated blood pressure in certain populations, especially in socioeconomically disadvantaged groups. [25] The discrepancies in findings across studies could be due to differences in socioeconomic status, healthcare access, and lifestyle factors that influence hypertension rates differently among different demographic groups. [26]

Regarding total cholesterol and glucose levels, this study found that both males and females exhibited healthy cholesterol and glucose levels, which aligns with previous research showing lower rates of hypercholesterolemia among Black African populations compared to other racial groups. [27] This supports the idea that Black Africans generally have a more atheroprotective lipid profile than other ethnicities, which might offer some protection against cardiovascular disease and other metabolic disorders.

The study's findings on WC and WHR also provide insights into how ethnic differences in fat distribution can influence NCD risk. While global studies tend to report a higher prevalence of elevated WC in women, the results in this study suggest that the WC was higher in males, which could be influenced by ethnic variations in body composition. [28] For instance, some studies suggest that populations such as South Asians may exhibit higher abdominal fat levels despite having lower BMI values, further highlighting that WC can be a better indicator of health risks than BMI alone. [28] These differences underscore the importance of using context-specific measures and cutoffs, particularly in populations with diverse genetic and environmental backgrounds.

These findings have several important implications for public health interventions. The higher WC and systolic blood pressure observed in males, particularly in this peri-urban community, suggest the need for tailored interventions that specifically address these risk factors in this population. Given the variations in NCD risk factors between genders and ethnicities, it is crucial to implement context-specific public health strategies. These strategies should consider cultural, dietary, and lifestyle differences when designing interventions aimed at reducing the prevalence of NCDs, particularly abdominal obesity and hypertension, in both males and females.

The physiological risk factors identified in this study, namely, overweight and obesity, elevated waist circumference, hypertension, and physical inactivity, are well-established contributors to the onset and progression of NCDs. Effective management of these risk factors requires a multifaceted approach that combines both preventive and therapeutic strategies. Traditional public health interventions, including the promotion of balanced diets, increased physical activity, smoking cessation, and regular health screenings, remain essential components of NCD prevention and control. [29,30]

However, in peri-urban communities where healthcare infrastructure is often limited, innovative approaches such as telemedicine and mobile health (mHealth) technologies offer promising alternatives. Telemedicine facilitates remote consultations, ongoing disease monitoring, and patient education, services that are particularly valuable in underserved areas. Complementarily, mHealth tools such as mobile apps, wearable fitness devices, and SMS-based reminders can support individuals in tracking their health behaviours, improving adherence to treatment, and maintaining long-term lifestyle changes. Evidence supports the effectiveness of these digital strategies. George and George [31] highlight telemedicine's role in delivering scalable, cost-effective healthcare while enhancing health literacy and bridging service delivery gaps. Widmer et al. [32] found that digital health interventions improved adherence to cardiac rehabilitation programs and reduced recurrence of cardiac events. Similarly, Hayıroğlu et al. [33] demonstrated that mobile applications and smart devices significantly enhanced cardiorespiratory fitness, measured through increased peak oxygen consumption (VO_2 peak), in individuals at high cardiovascular risk.

Despite their potential, the implementation of digital health interventions in peri-urban settings must be guided by context-specific research. Socio-economic constraints, cultural beliefs, digital literacy, and access to technology, all influence the success of these innovations.[34] As such, further research is essential to evaluate the feasibility, acceptability, and long-term impact of integrating telemedicine and mHealth into existing healthcare frameworks in these communities. When effectively adapted, these tools can enhance NCD management, reduce disparities in care, and empower individuals to take greater control of their health.[34]

The initial phase of the WHO STEPwise protocol implemented in this study involved collecting self-reported data on participants' socioeconomic and demographic characteristics. However, subjective data of this nature may lack generalizability and transferability across different populations. This is particularly relevant as the study's sample was drawn from a specific peri-urban area, and participants may not fully represent the broader Black African adult population in South Africa. Furthermore, the sampling approach, while pragmatic and intentional, used voluntary sampling, which may introduce bias, as participants who were willing to volunteer may differ systematically from those who chose not to participate, potentially affecting the findings. The convenience of voluntary sampling also raises concerns about self-selection bias, where individuals with higher awareness or personal interest in NCDs might have been more likely to participate, thus overrepresenting those at risk for such conditions.

A significant proportion of participants were young and institutionalized, which may have affected the overall quality and reliability of the collected data. These characteristics are not typical of the broader adult population, leading to potential age-related bias. Given that the study primarily relied on self-reported information, there was a possibility that some participants provided inaccurate responses, either due to embarrassment or a desire to present themselves favourably. Additionally, participants may have selectively disclosed certain information while omitting other details, further influencing the data's accuracy. Memory recall bias also posed a potential limitation, particularly concerning self-reported engagement in risk behaviours. These biases could lead to an underestimation or overestimation of certain risk factors, such as dietary habits or physical activity levels.

The study area was limited to a particular district, rather than the entire province or country. Consequently, generalizing these findings to the broader national population would be inappropriate. The demographic characteristics of the study participants, such as their younger age and the geographical scope of the research, may not fully reflect the diversity of experiences, behaviours, and risk factors present in other regions of South Africa. Further nationwide studies on NCDs and their associated risk factors are essential to provide a more precise estimation of the country's NCD burden. Another notable limitation of this study was the relatively young age of the participants, which may have contributed to either over-reporting or under-reporting of certain risk factors. Younger adults may not yet exhibit some of the typical markers for chronic NCDs like hypertension or diabetes, leading to a potential underreporting of these conditions. Conversely, self-reported risk behaviours such as smoking, alcohol consumption, or dietary habits may have been influenced by social and peer pressure, which could affect the reliability of the data.

5. Conclusion

This study highlights a concerning prevalence of modifiable physiological risk factors for non-communicable diseases (NCDs) among Black African adults in the peri-urban community of KwaDlangezwa. Overweight and obesity, elevated waist circumference, and raised blood pressure emerged as prominent risk factors, particularly among females and younger individuals. These findings reflect the shifting health burden associated with urbanization and lifestyle transitions in peri-urban environments, where rural and urban risk profiles intersect.

Given the disproportionate distribution of these risk factors by age and gender, targeted public health interventions are urgently needed. These should focus on promoting physical activity, healthy dietary practices, and routine health screenings, particularly in young adults who may not perceive themselves as at risk. Additionally, interventions must be culturally appropriate and context-specific to effectively address the unique socio-economic and environmental challenges faced by peri-urban communities.

From a practical perspective, integrating community-based health education programs and school or university-level wellness initiatives can serve as effective entry points for early intervention. Furthermore, leveraging mobile health (mHealth) platforms and telemedicine services could improve access to preventive care and chronic disease management, especially in settings with limited healthcare infrastructure. These digital tools can support behavior change, facilitate regular monitoring, and bridge critical gaps in healthcare access.

In conclusion, the data generated from this study can inform policy development and support the design of evidence-based strategies to reduce NCD risk in under-resourced, peri-urban populations. Expanding research across similar communities is essential to build a broader understanding of risk factor trends and to guide the implementation of scalable, sustainable health interventions across South Africa and comparable regions.

Ethical consideration

This study received ethical approval from the Humanities Research Ethics Committee of the University of Zululand (UZREC) (UZREC 171110-030) and complied with institutional and national research guidelines. Written informed consent was obtained from all participants after providing detailed information about the study. Participation was voluntary, with the right to withdraw at any time without consequence. To ensure confidentiality and anonymity, all personal identifiers were removed, and data were securely stored in a password-protected system. The study adhered to the University's Research Policy on ethical research conduct and data protection, ensuring no harm to participants.

Authors' contribution

S.Z.M conducted the research, including study design, data collection, analysis, and manuscript writing. G.J.B aided with the study design, guided the research methodology, manuscript writing and revision. B.S.S aided with the study design, guided the research methodology, and contributed to manuscript revisions. I.S aided with the study design, guided the research methodology, and contributed to manuscript revisions.

Availability of data and materials

The data underlying the study findings can be obtained from the corresponding author upon request.

Source of funding

None.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: The authors declare no competing financial or personal interests that could have influenced the research. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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