ORIGINAL ARTICLE | ASIAN JOURNAL OF MEDICAL SCIENCES

Anthropometric predictors of hypertension in Gujarat's rural population: A community-based study through family adoption programme

Urvish K Joshi[1], Mitali T Solanki[2], Mudra A Mehta[3], Bhargav B Dave[4], Sheetal Shrimali[5], Mayank J Patel[6]

[1]Associate Professor, [2,3,6]Assistant Professor, [4]Tutor, [5]Professor and Head, Department of Community Medicine, Narendra Modi Medical College, Ahmedabad, Gujarat, India

Submission: 17-06-2025 Revision: 28-07-2025 Publication: 01-09-2025

ABSTRACT

Background: In rural India, there is an increasing prevalence of non-communicable diseases, especially high blood pressure (BP) and obesity. The family adoption programme, launched by National Medical Commission, allows medical students to connect with underserved communities while collecting important health data. **Aims and Objectives:** To evaluate the anthropometric measurements and the occurrence of hypertension in a rural population in Gujarat, as well as to compare how effectively body mass index (BMI) and waist-to-hip ratio (WHR) predict cardiovascular risk. **Materials and Methods:** During household visits by 1st-year MBBS students from November 2024 to February 2025, a cross-sectional study was carried out in the rural regions of Ahmedabad District, Gujarat. Information was gathered from 1255 individuals using structured instruments that included demographics, BMI, WHR, and BP. **Results:** The mean age of participants was 42.3 years. 56.6% had central obesity as determined by WHR, and 50.4% were classified as hypertensive with BP readings of 130/80 mmHg or higher. The prevalence of obesity increased with age and was more common in males. WHR demonstrated a stronger association with both systolic ($r=0.35$) and diastolic BP (DBP) ($r=0.28$) compared to BMI. In predicting hypertension, WHR exhibited greater sensitivity (70.0%) but lower specificity (53.3%) than BMI, which had a sensitivity of 58.3% and specificity of 75.0%. Regression analyses further supported WHR as a more robust predictor of both systolic and DBP. **Conclusion:** This rural population exhibited high levels of central obesity and hypertension. WHR proved to be a more effective screening tool for cardiovascular risk than BMI.

Key words: Anthropometry; Obesity; Hypertension; Cardiovascular diseases; Non-communicable diseases; Prevention and control; Family adoption programme

Access this article online

Website:

https://ajmsjournal.info/index.php/AJMS/index

DOI: 10.71152/ajms.v16i9.4671

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Universal health coverage emphasizes the need for strong primary healthcare, especially in underserved rural areas.[1] Medical education is crucial for equipping doctors to meet healthcare demands, and community-based medical education has become essential.[2] Recognizing the importance of early exposure to community health, the National Medical Commission (NMC) in India has incorporated the family adoption program (FAP) into the competency-based undergraduate medical education curriculum. FAP provides medical students exposure to community health dynamics while addressing healthcare needs in underserved regions.[3] This program aims to guide students towards primary healthcare and serve as a link between the population and healthcare services.[2]

Address for Correspondence:
Bhargav B Dave, Tutor, Department of Community Medicine, Narendra Modi Medical College, Ahmedabad, Gujarat, India.
Mobile: +91-99743 87155. **E-mail:** drbhargavdavecm@gmail.com

Initiated with the MBBS batch of 2021–2022, the FAP is inspired by previous models of community-oriented medical education.[2,4] Qualitative research has examined FAP's strengths, weaknesses, and challenges, highlighting its potential to enhance students' understanding of community medicine.[2] Students report that FAP visits improve their communication skills and ability to assist with community health issues.[5] FAP serves as primary healthcare training and data source for improving health outcomes. Initially, students conduct household visits to gather baseline data on their adopted families' health profiles.

As FAP's framework and objectives become defined, it is crucial to record initial health conditions of communities involved, particularly as evaluated by medical students starting their education.[6] Understanding baseline health metrics of these families can provide insight into community health needs and student educational experiences.

Aims and objectives

This research, carried out under the FAP umbrella, evaluated anthropometric data and hypertension prevalence in a rural Gujarati population. The goals included investigating relationships between demographic factors (age and gender), anthropometric measures like body mass index (BMI) and waist-to-hip ratio (WHR), and cardiovascular risk (hypertension), while comparing BMI versus WHR effectiveness in predicting obesity and hypertension risk in this community context.

MATERIALS AND METHODS

Study design and setting

This research utilized an observational, cross-sectional approach to evaluate anthropometric measurements and cardiovascular risk factors among a rural community in Gujarat, India. Data were gathered during FAP household visits carried out by 1st-year MBBS students from affiliated institute of the authors between November 2024 and February 2025, in rural areas associated with PHC Kasindra, Daskroi Taluka, Ahmedabad District, central Gujarat region.

Study population and sampling

The study focused on individuals in households that were part of the FAP initiative. Participants were selected based on availability and willingness during students' planned adoption of families. Due to the FAP's nature, convenience sampling was used, including those encountered during program activities. Each student of 200-batch strength was allotted 3 families, totaling 600 families. Children below 15 years were excluded from analysis due to study objectives involving anthropometric measures and hypertension risk. The analysis included data from 1255 participants, though sample size varied for certain variables due to missing data. No formal pre-study sample size calculation was done, as the sample represents the total cohort reached through FAP data collection by students.

Data collection procedures and variables

A structured data collection tool, adapted from standardized forms or FAP protocols, was used. Students were trained in measurement techniques beforehand. The data collected encompassed:

Demographic information

This included age (in years), gender, monthly family income (in INR), and family size.

Anthropometric measurements

Standard techniques were employed to measure weight (in kg), height (in cm), waist circumference (in cm), and hip circumference (in cm). The BMI was determined by dividing weight (kg) by height (m) squared. The WHR was calculated by dividing waist circumference (cm) by hip circumference (cm).

Clinical measurements

Blood pressure (BP) was recorded using standardized digital devices, capturing both systolic BP (SBP) and diastolic BP (DBP) in mmHg.

Variable definitions and classifications

In the Indian context, standard definitions and classifications were applied:

BMI was categorized using both the traditional World Health Organization cutoffs and criteria specific to Asians (e.g., normal is <23 kg/m^2, Overweight ranges from 23.0 to 24.9 kg/m^2, and Obesity is 25 kg/m^2 or higher; these categories have been updated to consider complications related to adiposity).[7,8]

Central obesity was determined by waist circumference (90 cm or more for males, 80 cm or more for females) and WHR (0.90 or more for males, 0.85 or more for females).[7,8]

BP was classified based on the 2017 guidelines from the American Heart Association (AHA)/American College of Cardiology: Normal is <120/80 mmHg, elevated is 120–129/<80 mmHg, Stage 1 hypertension is 130–139/80–89 mmHg, and Stage 2 hypertension is 140/90 mmHg or higher. For the purpose of analyzing hypertension risk, a threshold of 130/80 mmHg or higher was primarily utilized.[9]

Ethical considerations

Informed consent was obtained from adult participants and guardians of minors, ensuring confidentiality and voluntary participation. Participants were briefed on the FAP framework purpose. As FAP is mandated by NMC for annual data collection and publication, and no invasive procedures were involved, ethical clearance was not essential but was procured. Data was collected as activity records.

Statistical analysis

Data were analyzed using R v.4.5.0.[10] Descriptive statistics (mean, Standard deviation [SD], median, interquartile range [IQR], frequencies, percentages) summarized participant characteristics and variables. Statistical analyses included: Chi-square tests to examine relationships between categorical variables like obesity prevalence across age groups and genders; Pearson correlation to assess relationships between continuous variables (BMI, WHR, SBP, DBP); Kappa statistic to evaluate agreement between obesity classifications; receiver operating characteristic (ROC) curve analysis with area under the curve (AUC), sensitivity, and specificity to compare BMI and WHR for hypertension prediction. Binary logistic regression identified hypertension predictors (≥130/80 mmHg), calculating odds ratio (OR) and 95% confidence interval. Multiple linear regression explored associations of age, gender, BMI, and WHR with SBP and DBP levels, reporting regression coefficients (β). Statistical significance was $P<0.05$, using pairwise complete observations for missing data.

RESULTS

The data collected is displayed in nine tables, covering demographics, anthropometric measurements, BP readings, obesity correlations, and the prevalence of comorbidities.

Table 1 shows demographic and clinical features of participants (n=1255). Mean age was 42.3 years (SD=17.5, n=1250), with equal gender distribution. Median monthly family income was 15,000 INR (IQR 7,000–35,000; n=1200), with average family size of five members (SD=2, n=1240). Participants had average weight of 60.2 kg (SD=13.4), height of 160.5 cm (SD=9.8), and BMI of 23.3 kg/m^2 (SD=4.2; all n=1230). Mean waist circumference was 85.5 cm (SD=11.8), hip circumference 95.0 cm (SD=10.5), and WHR 0.90 (SD=0.06; all n=1220). BP averaged 125.6 mmHg systolic (SD=16.2) and 81.4 mmHg diastolic (SD=9.8; both n=1210). Sample sizes varied due to missing data (Table 1).

Mean BMI varied from 22.8 kg/m^2 (SD=3.9) in younger participants (15–45 years; n=740) to 24.0 kg/m^2 (SD=4.5) in middle-aged adults (46–60 years; n=340), and 23.5 kg/m^2 (SD=4.0; n=150) in older adults (>60 years). SBP increased from 120.5 mmHg (SD=14.0) to 135.0 mmHg (SD=18.0), while DBP rose from 78.2 mmHg (SD=8.5) to 85.0 mmHg (SD=10.0) with age, indicating increased cardiovascular risk (Table 2).

Table 1: Overall descriptive statistics of study subjects

Variable	N	Value (Proportions, Mean±SD & Range)
Age (years)	1250	42.3±17.5
Gender	1255	–
Male	1255	n=625 (49.8%)
Female	1255	n=630 (50.2%)
Monthly income (INR)	1200	15000 (7000–35000)
Family size	1240	5±2
Weight (kg)	1230	60.2±13.4
Height (cm)	1230	160.5±9.8
BMI (kg/m^2)	1230	23.3±4.2
Waist circumference (cm)	1220	85.5±11.8
Hip circumference (cm)	1220	95.0±10.5
WHR	1220	0.90±0.06
SBP (mmHg)	1210	125.6±16.2
DBP (mmHg)	1210	81.4±9.8

"n" varies due to missing values. SD: Standard deviation, BMI: Body mass index, WHR: Waist-to-Hip Ratio, BP: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3 categorizes participants by BMI criteria, central obesity indicators, and BP categories, with sample sizes varying slightly (BMI: n=1230, central obesity: n=1220, BP: n=1210). Over 60% of participants have BMI ≥23 kg/m^2, with one-third having related health issues. More than half show central obesity, with higher prevalence by WHR. About half (50.4%) have hypertension, while one-third maintain normal BP. These data indicate significant obesity and BP concerns in this population (Table 3).

Obesity (BMI ≥25 kg/m^2) showed significant associations with age and gender (Figure 1). Obesity prevalence increased from 35.0% in younger adults (15–45 years, n=259/740) to 45.0% in middle-aged (46–60 years, n=153/340), and 55.3% in those over 60 (n=83/150) (χ^2=26.6, df=2, $P<0.001$). Males showed higher obesity rates (48.4%, n=300/620) compared to females (32.8%, n=200/610) (χ^2=4.5, df=1, $P=0.03$).

A comparison of BMI and WHR classifications among 1,220 participants showed moderate agreement (Kappa=0.35), with both measures identifying 520 individuals as "Normal" and 320 as "Obese." There was significant discordance: 200 participants were labeled "Obese" by BMI but "Normal" by WHR, while 180 had opposite classification. The agreement between measures was 68.9%. Both showed equal sensitivity (61.5%) and specificity (74.3%). WHR demonstrated higher area under ROC curve (AUC=0.75)

Table 2: Mean BMI and BP, stratified by age groups

Variable	15–45 years (n=750)	46–60 years (n=350)	>60 years (n=155)
Mean BMI (kg/m²) (n=1230)	22.8±3.9 (n=740)	24.0±4.5 (n=340)	23.5±4.0 (n=150)
Mean SBP (n=1210)	120.5±14.0 (n=730)	128.2±15.5 (n=335)	135.0±18.0 (n=145)
Mean DBP (n=1210)	78.2±8.5 (n=730)	82.5±9.0 (n=335)	85.0±10.0 (n=145)

Total respondents with valid age sum to 1255. Within each group,: "N" for BMI and BP is slightly lower due to missing values. BMI: Body mass index, BP: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 3: Obesity classification along with BP categorization of study subjects

Variable	n	Percentage
Obesity classification as per updated BMI category (n=1230)		
Normal (<23 kg/m²)	480	39.00
Stage 1 obesity (≥23 kg/m² (increased adiposity without apparent complications))	370	30.10
Stage 2 obesity (≥23 kg/m² [increased adiposity with associated health issues])	380	30.90
Obesity classification as per traditional BMI category (n=1230)		
Normal (18.5–22.9 kg/m²)	450	36.60
Overweight (23.0–24.9 kg/m²)	280	22.80
Obesity Class I (25.0–29.9 kg/m²)	330	26.80
Obesity Class II (≥30.0 kg/m²)	170	13.80
Obesity classification as per central obesity measure (n=1220)		
Waist circumference (cm) (≥90 cm [men], ≥80 cm [women])	650	53.30
WHR (≥0.90 [men], ≥0.85 [women])	690	56.60
Blood pressure category (n=1210)		
Normal (<120/80 mmHg)	400	33.10
Elevated (120–129/<80 mmHg)	200	16.50
Stage 1 HTN (130–139/80–89 mmHg)	320	26.40
Stage 2 HTN (TNge00d mmHg)	290	24.00

HTN: Hypertension, BMI: Body mass index, WHR: Waist-to-hip ratio, BP: Blood pressure

compared to BMI (AUC=0.72), indicating better predictive ability for obesity-related cardiovascular risk. This was supported by WHR's greater sensitivity in detecting hypertensive individuals. These findings suggest WHR might be more effective for screening in rural health settings (Figure 2).

Table 4 presents Pearson correlations between BMI, WHR, and BP using pairwise observations (n=1200–1220). BMI and WHR correlated moderately (r=0.45, n=1220, P<0.01). BMI correlated with SBP (r=0.30, n=1200, P<0.01) and DBP (r=0.25, n=1200, P<0.01). WHR showed stronger correlations with SBP (r=0.35, N=1200, P<0.01) and DBP (r=0.28, n=1200, P<0.01), supporting the link between obesity indicators and BP.

WHR (thresholds: ≥0.90 men, ≥0.85 women) and BMI (≥25 kg/m²) were compared in predicting hypertension (BP ≥130/80 mmHg) among 1200 participants. WHR showed higher sensitivity (70.0% vs. 58.3%) but lower specificity (53.3% vs. 75.0%) than BMI (Table 5).

Regression analyses (n=1180) showed age, BMI, and WHR significantly correlated with hypertension (P<0.01) and

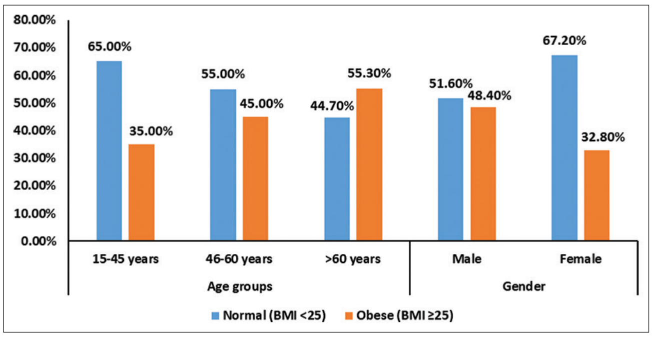

Figure 1: Association of obesity with age and gender. Age group: χ^2=26.6, df=2, P<0.00, Gender: χ^2=4.5, df=1, P=0.03

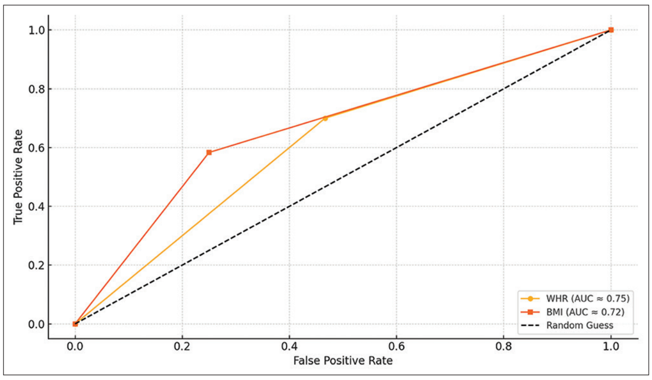

Figure 2: Receiver operating characteristic curve for waist-to-hip ratio and body mass index predicting hypertension

blood pressure levels (P<0.01). WHR strongly predicted hypertension (OR=2.15) and blood pressure (Systolic β=10.5, Diastolic β=5.0). Male gender linked only to higher SBP (P=0.03), not DBP (P=0.07) or hypertension (P=0.22) (Table 6).

Results highlight relationships between anthropometric measures, demographics, and cardiovascular health indicators like hypertension and BP in the study group.

DISCUSSION

This research reveals key anthropometric and BP findings from rural Gujarat through FAP. The average BMI was 23.3 kg/m², with over 60% classified as overweight/obese by Asian standards. Central obesity was prevalent in over half the population based on WHR and waist circumference. Hypertension prevalence was 50.4% using

Table 4: Correlation coefficients (BMI, WHR and BP)

Pair	n	r	P-value
BMI versus WHR	1220	0.45	<0.01
BMI versus SBP	1200	0.3	<0.01
WHR versus SBP	1200	0.35	<0.01
BMI versus DBP	1200	0.25	<0.01
WHR versus DBP	1200	0.28	<0.01

"n" is pairwise complete observations (e.g., 1200 where both BMI and SBP are non-missing). BMI: Body mass index, WHR: Waist-to-hip ratio, BP: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

Table 5: Sensitivity and specificity of WHR and BMI in hypertension

Metric	WHR	BMI
Condition	Hypertension (BP≥130/80)	Hypertension (BP≥130/80)
Total sample size (N)	1200	1200
Positive cases	700 (WHR ≥0.90 M, ≥0.85 F)	500 (BMI ≥25)
True positives (TP)	420	350
False positives (FP)	280	150
True negatives (TN)	320	450
False negatives (FN)	180	250
Sensitivity (%)	70.00	58.30
Specificity (%)	53.30	75.00

"n=1200" where both predictor (WHR/BMI) and outcome (BP) are valid. BMI: Body mass index, WHR: Waist-to-hip ratio

Table 6: Regression analysis for hypertension

Variable	n	OR/β	95% CI	P-value
Logistic regression analysis for hypertension				
Age (years)	1180	1.03	1.02–1.04	<0.01
Gender (male)	1180	1.18	0.91–1.54	0.22
BMI (kg/m²)	1180	1.1	1.07–1.13	<0.01
WHR	1180	2.15	1.85–2.50	<0.01
Linear regression analysis for SBP				
Age (years)	1180	0.35	0.30–0.40	<0.01
Gender (male)	1180	2.5	0.20–4.80	0.03
BMI (kg/m²)	1180	0.8	0.65–0.95	<0.01
WHR	1180	10.5	8.0–13.0	<0.01
Linear regression analysis for DBP				
Age (years)	1180	0.15	0.10–0.20	<0.01
Gender (male)	1180	1.2	−0.10–2.50	0.07
BMI (kg/m²)	1180	0.4	0.30–0.50	<0.01
WHR	1180	5	3.5–6.5	<0.01

OR: Odds ratio, CI: Confidence interval, BMI: Body mass index, WHR: Waist-to-hip ratio, BP: Blood pressure, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

AHA criterion (≥130/80 mmHg), higher than traditional estimates due to stricter thresholds. WHR demonstrated better hypertension prediction capability than BMI for rural screenings.

The FAP by the NMC serves as a model for community health engagement.[3] By integrating medical students into rural households, this initiative enhances medical education's social responsibility while collecting health data difficult to gather through facility-based methods. The program enables direct collection of health data in real settings, providing insights into community health patterns and contributing to public health monitoring in underserved areas.

Research shows BMI and WHR inconsistently identify obesity. Of 1220 participants, 320 were obese by both measures, with 380 discrepancies, showing drawbacks of one metric. WHR had a higher AUC (0.75) than BMI (0.72), with better sensitivity (70.0% vs. 58.3%) but lower specificity (53.3% vs. 75.0%) for hypertension prediction. This supports literature suggesting central adiposity is a better cardiovascular risk indicator than overall adiposity.[11-13] BMI is easy to calculate but ignores fat distribution, an issue for South Asians prone to visceral obesity.[14]

Gender differences were significant, with higher obesity rates in males (48.4%) versus females (32.8%) (χ^2=4.5, P=0.03), and male gender independently increased SBP (β=2.5, P=0.03). While not linked to overall hypertension odds (P=0.22), these results suggest higher cardiovascular risk in rural men. This aligns with studies showing varied gender patterns in rural Indian hypertension.[15-18]

Age correlated strongly with anthropometric and hemodynamic measures. BMI and BP increased across age groups: SBP rose from 120.5 mmHg (15–45 years) to 135.0 mmHg (>60 years), while DBP increased from 78.2 mmHg to 85.0 mmHg. Obesity prevalence increased from 35.0% in younger to 55.3% in older adults (χ^2=26.6, P<0.001), reflecting national statistics on age-related hypertension and obesity.[14,15,19] Simple anthropometric assessments can help identify at-risk older adults for targeted interventions.

Body measurements correlate with BP, confirming their value in hypertension risk assessment. WHR showed stronger correlations with systolic (r=0.35) and diastolic pressure (r=0.28) than BMI (r=0.30, r=0.25). Regression analysis revealed WHR had the highest hypertension odds ratio (OR=2.15, P<0.01), highlighting its effectiveness as a screening method in resource-limited healthcare settings.

Public health implications

The high rates of obesity and hypertension in this rural Gujarati population demonstrate the need for community strategies to prevent non-communicable diseases (NCD), aligning with government initiatives.[20] Using WHR or BMI measurements could effectively identify cardiovascular risk factors in rural health programs. Health education and FAP-based monitoring can enhance local involvement in preventive care within India's health system.[4,20,21]

Limitations of the study

Data collection by 1st-year MBBS students may have introduced measurement variability, affecting consistency. The cross-sectional design limits causal inference. Convenience sampling within FAP may limit generalizability to rural populations. Minor missing data across variables affected sample sizes. The study focused on physiological variables like BMI, WHR, and BP over sociodemographic analysis. Despite limitations, the study contributes to understanding cardiovascular health in rural settings.

CONCLUSION

This study from central rural Gujarat, using the FAP approach, reveals significant obesity and hypertension rates, with WHR as a valuable cardiovascular risk predictor. The methodology highlights FAP's role in data collection and student training. The findings support including anthropometric screening in rural health strategies and recommend research on cost-effective monitoring of NCD. Future studies could provide insights into cardiovascular risk epidemiology in underserved communities.

Recommendations

Given the impact of hypertension and central obesity in this rural community, future FAP versions should include training modules on NCD risk assessment for medical students. Local health systems should incorporate WHR-based screening into outreach efforts for early cardiovascular risk identification. Partnerships between academic institutions and primary care services will be vital for student-led data into public health strategies.

ACKNOWLEDGMENT

Nil.

REFERENCES

1. Banerjee B. Innovative strategies in medical education for addressing gaps in health-care service in rural India. MAMC J Med Sci. 2022;8(1):11-17.
   https://doi.org/10.4103/mamcjms.mamcjms_119_21
2. Reshmi PS, Lunagariya R, Patel H, Patel N, Chauhan D and Patel R. Qualitative study to identify strengths, weakness, opportunities, and challenges of family adoption programs among students. Indian J Community Med. 2024;49(4):610-616.
   https://doi.org/10.4103/ijcm.ijcm_58_23
3. Chakraborty A, Sarkar N, Lahiri U, Bhowmick S, Sen S, Majumdar R, et al. Family adoption program in medical education and role of community medicine in its implementation in India: An overview. J Integr Med Public Health. 2023;2(2):49-53.
   https://doi.org/10.4103/JIMPH.JIMPH_18_23
4. Shikha S, Kumar A, Begum J, Ali SI and Tripathy S. Family adoption program for undergraduate medical students at a new medical school of Jharkhand: An experience and SWOC analysis. Indian J Community Med. 2024;49(1):218-222.
   https://doi.org/10.4103/ijcm.ijcm_954_22
5. Arora P, Hossain SR, Sharma V and Budh N. First-year medical undergraduate students' perceptions and experiences regarding family adoption program: Challenges and lessons. J Med Acad. 2023;6(2):49-52.
   https://doi.org/10.5005/jp-journals-11003-0132
6. Ganganahalli P, Jain A, Dongre A and Udgiri R. Development and validation of an interprofessional community-based teaching-learning module for a family adoption programme for Indian medical undergraduates. Cureus. 2024;16(8):e67150.
   https://doi.org/10.7759/cureus.67150
7. Misra A, Chowbey P, Makkar BM, Vikram NK, Wasir JS, Chadha D, et al. Consensus statement for diagnosis of obesity, abdominal obesity and the metabolic syndrome for Asian Indians and recommendations for physical activity, medical and surgical management. J Assoc Physicians India. 2009;57:163-70.
8. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363(9403):157-163.
   https://doi.org/10.1016/S0140-6736(03)15268-3
9. Whelton PK, Carey RM, Aronow WS, Casey DE Jr., Collins KJ, Himmelfarb CD, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: A report of the American college of cardiology/American heart association task force on clinical practice guidelines. Hypertension. 2018;71(6):1269-1324.
   https://doi.org/10.1161/HYP.0000000000000066
10. R Core Team. A Language and Environment for Statistical Computing. R Version 4.5.0. R Foundation for Statistical Computing. Vienna, Austria: R Core Team. Available from: https://www.r-project.org [Last accessed on 2025 Jun 10].
11. Muhammad T, Paul R, Rashmi R and Srivastava S. Examining sex disparity in the association of waist circumference, waist-hip ratio and BMI with hypertension among older adults in India. Sci Rep. 2022;12(1):13117.
    https://doi.org/10.1038/s41598-022-17518-z
12. Rajput R, Rajput M, Bairwa M, Singh J, Saini O and Shankar V. Waist height ratio: A universal screening tool for prediction of metabolic syndrome in urban and rural population of Haryana. Indian J Endocrinol Metab. 2014;18(3):394-399.
    https://doi.org/10.4103/2230-8210.131201
13. Kurpad SS, Tandon H and Srinivasan K. Waist circumference correlates better with body mass index than waist-to-hip ratio in Asian Indians. Natl Med J India. 2003;16(4):189-192.
14. Verma M, Rajput M, Kishore K and Kathirvel S. Asian BMI criteria are better than WHO criteria in predicting hypertension: A cross-sectional study from rural India. J Family Med Prim Care. 2019;8(6):2095-2100.
    https://doi.org/10.4103/jfmpc.jfmpc_257_19
15. Mohammad R and Bansod DW. Hypertension in India: A gender-based study of prevalence and associated risk factors. BMC Public Health. 2024;24(1):2681.
    https://doi.org/10.1186/s12889-024-20097-5
16. Kokiwar PR, Gupta SS and Durge PM. Prevalence of hypertension in a rural community of central India. J Assoc Physicians India. 2012;60:26-29.
17. Gupta R. Trends in hypertension epidemiology in India. J Hum Hypertens. 2004;18(2):73-78.
    https://doi.org/10.1038/sj.jhh.1001633

18. Sundaresan M, Velmurugan G, Dhivakar M, Ramakrishnan A, Cherian M, Alexander T, et al. Gender differential prevalence of overweight and obesity, hypertension and diabetes in South India: A population-based cross-sectional study. Glob Heart. 2024;19(1):72.

https://doi.org/10.5334/gh.1354

19. Vijna and Mishra CP. Prevalence and predictors of hypertension: Evidence from a study of rural India. J Family Med Prim Care. 2022;11(3):1047-1054.

https://doi.org/10.4103/jfmpc.jfmpc_967_21

20. Mohan I, Gupta R, Misra A, Sharma KK, Agrawal A, Vikram NK, et al. Disparities in prevalence of cardiometablic risk factors in rural, urban-poor, and urban-middle class women in India. PLoS One. 2016;11(2):e0149437.

https://doi.org/10.1371/journal.pone.0149437

21. Kandasamy K, Sundaram RS, Kameswaran R and Karthickeyan K. Prevalence of diagnosed and undiagnosed diabetes in a rural community: A home-based screening. Asian J Pharm Clin Res. 2018;11(5):454.

https://doi.org/10.22159/ajpcr.2018.v11i5.24906

Authors' Contributions:
UKJ- Concept, literature survey, design, prepared first draft of manuscript, data collection, data analysis, manuscript preparation and submission of article, statistical analysis and interpretation; MTS- Data collection, data analysis, manuscript preparation; MAM- Data collection, data analysis, manuscript preparation; BBD- Concept, design, clinical protocol, manuscript preparation, editing and manuscript revision; SS- Concept, design of study, implementation of study protocol, statistical analysis and Interpretation; MJP- Data collection, data analysis, manuscript preparation.

Work attributed to:
Department of Community Medicine, Narendra Modi Medical College, Ahmedabad, Gujarat-380008, India.

Orcid ID:
Dr. Urvish K Joshi - https://orcid.org/0000-0002-9204-5614
Dr Mitali Solanki - https://orcid.org/0009-0003-9164-7896
Dr Mudra Mehta - https://orcid.org/0009-0008-2929-976X
Dr. Bhargav B Dave - https://orcid.org/0009-0000-5570-9699
Dr. Sheetal Shrimali - https://orcid.org/0000-0002-2756-6608

Source of Support: Nil, **Conflicts of Interest:** None declared.