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THE TRIPLE SILENCE OF CARDIOMETABOLIC RISK: AWARENESS, SYMPTOMS AND DIAGNOSIS VERSUS MEASURED CENTRAL OBESITY AND ELEVATED BLOOD PRESSURE IN A NORTH INDIAN COMMUNITY

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ABSTRACT: Background: Detection of metabolic non-communicable disease in the community depends on whether individuals recognise the concept of clustered cardiometabolic risk, perceive that they may be affected, and have been clinically diagnosed. Whether these three subjective channels track objectively measured risk has not been studied in the same individuals. **Methods:** Community-based cross-sectional survey of 458 consenting adults (aged ≥18 years) attending voluntary cardiometabolic health camps in and around Varanasi district, Uttar Pradesh, India, between 2024 and 2026. Recruitment was a camp-based convenience sample and is not population-representative. We measured waist-hip ratio (WHR; central obesity defined as >0.90 in men and >0.85 in women) and seated blood pressure (BP) in duplicate using a calibrated digital oscillometric device; screen-positive elevated BP was defined as mean systolic ≥140 mmHg or diastolic ≥90 mmHg. Awareness of metabolic syndrome, a 9-item self-perceived symptom checklist, and prior physician-given diagnosis of hypertension, diabetes, obesity, dyslipidaemia, or heart disease were captured by a structured Hindi-language interview. Three pre-specified analyses tested whether each subjective channel tracked the objective markers: (i) multivariable Firth-penalised logistic regression for awareness (with robust-Poisson sensitivity); (ii) receiver-operating-characteristic (ROC) analysis with bootstrap confidence intervals for the symptom score; and (iii) sensitivity, specificity, and Cohen's κ for self-report against measurement. **Results:** Central obesity was present in 263/458 (57.4%) of participants and elevated BP in 205/438 (46.8%) of those measured; 361/458 (78.8%) had at least one. Only 60 (13.1%) had heard of metabolic syndrome. Awareness was independent of objective risk (adjusted OR for central obesity 1.03, 95% CI 0.55 to 1.94; for elevated BP 0.95, 0.51 to 1.77) and was driven by higher education (postgraduate vs illiterate OR 55.9, 10.5 to 296.8) and female sex (OR 1.95, 1.05 to 3.64). The 9-item symptom score did not discriminate central obesity (AUC 0.50, 0.45 to 0.55), elevated BP (0.51, 0.46 to 0.57), or either marker. Self-report of prior diagnosis detected almost no measured disease: sensitivity 2.9% for elevated BP and 2.7% for central obesity, leaving 97.1% and 97.3% respectively without prior recognition. **Conclusions:** In this camp-based community sample, the cardiometabolic risk carried by most adults was conceptually unknown, symptomatically imperceptible, and clinically undiagnosed, a pattern we describe as a triple silence. Awareness, where present, was concentrated in the educated rather than the at-risk. Surfacing this hidden burden will require universal measurement-based screening coupled to point-of-contact communication, rather than reliance on knowledge, symptoms, or self-recognition. These findings are descriptive of the camp-attending population and should be confirmed in probability-sample surveys.

INTRODUCTION: India is in the midst of a metabolic non-communicable disease (NCD) transition.

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The nationally representative ICMR-INDIAB study reported a weighted prevalence of 35.5% for hypertension, 39.5% for abdominal obesity, and 11.4% for diabetes among adults, with most metabolic NCDs more frequent in, but no longer confined to, urban areas [1]. The clustering of abdominal obesity, raised blood pressure, dysglycaemia, and dyslipidaemia, collectively the metabolic syndrome, multiplies cardiovascular risk beyond the sum of its parts; community prevalence in India has been estimated at roughly one-quarter to one-third of adults [1, 2]. The public-health response to this burden rests on an implicit chain of assumptions: that people can recognise the idea of clustered cardiometabolic risk, that those affected will perceive something is wrong, and that contact with health services will diagnose them. Each link has been studied in isolation. Awareness of metabolic syndrome has been examined mainly among patients already carrying the diagnosis [3] or among health professionals [4], not in the general community. Undiagnosed hypertension is well documented: 82% of rural hypertensives in neighbouring Bangladesh were unaware of their condition [5], and community screening in rural western India newly identified hypertension in one in five adults [6].

These studies measure the diagnostic gap alone. To our knowledge, no community study has examined all three channels in the same individuals, asking whether conceptual awareness, perceived symptoms, and self-reported diagnosis actually correspond to objectively measured cardio-metabolic risk.

This distinction matters because the three channels imply different interventions. If awareness tracked risk, targeted education would suffice. If symptoms discriminated risk, symptom-prompted care-seeking would work. If self-recognition were accurate, self-referral would catch most cases. If, instead, the risk is silent on all three channels at once, then only universal, measurement-based screening can detect it, a more resource-intensive strategy central to India's National Programme for Prevention and Control of Non-Communicable Diseases (NPCDCS). We therefore quantified the concordance between subjective and objective cardiometabolic status in a North Indian camp-based community sample, hypothesising a priori that objective risk would be poorly reflected in awareness, symptoms, and self-reported diagnosis.

METHODS:

Study Design and Setting: This was a community-based cross-sectional analysis of the first survey wave of a programme funded by the Council of Science and Technology, Uttar Pradesh, entitled Public awareness about prevention of metabolic syndrome and assessment of prevailing cardiac problem of the society. The programme was conducted by the Department of Cardiology, Institute of Medical Sciences, Banaras Hindu University, in partnership with the Department of Kriya Sharir, Faculty of Ayurveda, IMS BHU, and the SRSNT Memorial Charitable Trust. A series of community health camps was held in and around Varanasi district, Uttar Pradesh, between 2024 and 2026, at sites that included Shivpur (Kashi Panchkroshi Marg), Lanka, Ramnagar, and Rajatalab, predominantly urban with peri-urban and limited rural representation. Each camp followed a uniform measurement and interview protocol delivered by trained surveyors fluent in the local language. The study is reported in accordance with the STROBE statement for cross-sectional studies.

Participants and Sampling: At each camp all adults presenting voluntarily were invited to take part. Surveyors administered a structured interview and performed anthropometric and blood-pressure measurements on site. Because participation was self-selected and camp-based, the sample is a community convenience sample and is not population-representative; estimates derived from it describe the camp-attending population rather than the wider region.

Inclusion Criteria: Adults aged ≥18 years presenting at any of the programme's health camps, able to provide written informed consent and complete the interview in Hindi or English, were eligible.

Exclusion Criteria: Minors (<18 years) and a single participant with an implausible anthropometric record (recorded standing height 63 cm) were excluded. Pregnancy, acute febrile illness on the day of the camp, known prior cardiovascular disease, and current antihypertensive therapy were not used as exclusion criteria; these were instead captured as descriptors and self-reported diagnoses, because the explicit study aim was to characterise undetected risk in a typical camp-attendance population. Of 615 valid records, 156 minors and 1 with implausible anthropometry were excluded, leaving 458 adults for analysis (participant flow, **Fig. 1**. Blood pressure was obtained in 438 of 458 participants (95.6%); the remaining 20 unmeasured values were treated as missing.

Measurements: Objective cardiometabolic markers. Weight, height, waist and hip circumference were measured using standard procedures with calibrated portable instruments. Body mass index (BMI) was calculated as weight (kg) divided by height $(m)^2$. The waist-hip ratio (WHR) defined central obesity using sex-specific thresholds, namely >0.90 in men and >0.85 in women [7]. Blood pressure was measured by trained surveyors using a calibrated digital oscillometric sphygmomanometer with an appropriately sized adult cuff (a large cuff was used where mid-arm circumference exceeded approximately 32 cm), placed on the right upper arm in the seated position with the back supported and feet flat. Measurement was performed after at least 5 minutes of quiet rest. Two readings were taken at least 1 minute apart and the mean of the two was used for analysis. Participants were requested to avoid caffeine, tobacco, and vigorous physical activity in the 30 minutes preceding measurement, with these instructions communicated at camp registration. Devices were checked for visible damage and battery integrity before each camp. Screen-positive elevated blood pressure was defined as mean systolic ≥140 mmHg or diastolic ≥90 mmHg.

We combined the two markers into "any cardiometabolic marker" (central obesity or elevated BP) and "both." We deliberately reserve the term hypertension for self-reported clinical diagnoses or for citation of prior literature. Single-visit screen-positive blood pressure overestimates the prevalence of clinically diagnosed hypertension and is therefore referred to throughout this paper as elevated, or screen-positive, blood pressure. Likewise, because fasting glucose, triglycerides, and high-density lipoprotein cholesterol were not measured in this camp setting, we did not attempt to diagnose metabolic syndrome by ATP-III, IDF, or harmonised criteria. The objective construct in this study is restricted to two of the five MetS components, central obesity by WHR and screen-positive elevated blood pressure.

Subjective Channels:

Awareness: Each participant was asked, in Hindi (with English option), whether they had ever heard of metabolic syndrome (heard_met_synd), whether they knew that cardiometabolic risk factors tend to cluster together (aware_risk_combo), and whether they believed lifestyle is a principal driver of cardiometabolic disease (belief_lifestyle).

These three binary items were summed into a 0–3 knowledge attitude composite, reported descriptively.

Perceived Symptoms: A 9-item checklist of self-perceived symptoms was administered: tiredness, excessive hunger, swelling, excessive thirst, perceived obesity, headache, a sense of raised blood pressure, difficulty performing usual activity, and skin patches or acanthosis. The 9 items were summed into an unweighted symptom count (0–9). Items were assembled to span (a) symptoms commonly attributed by lay populations to cardiometabolic risk in earlier Indian community KAP surveys (tiredness, headache, perceived obesity, a sense of raised BP), (b) classical diabetic-spectrum symptoms (polyphagia, polydipsia, polyuria proxies), and (c) examination-grade lay-visible signs of insulin resistance (skin patches or acanthosis nigricans). We did not pre-weight items because the pre-specified null hypothesis was that the unweighted score would carry no discriminative information for the objective markers; this is what we tested in Axis 2.

Self-reported Diagnosis: Participants were asked whether a physician had ever told them that they had high blood pressure, diabetes, obesity, dyslipidaemia, or heart disease (prior-diagnosis wording), and whether they were currently taking any regular medication (treatment item). Primary self-report sensitivities are reported against the prior-diagnosis item; the treatment item is reported in Supplementary Material S2.

Questionnaire Development and Language: The structured interview was administered in Hindi by surveyors fluent in the local language; an English option was available on request. Items were derived from previously used Indian community KAP surveys on cardiovascular disease and metabolic syndrome and were reviewed by the project investigators (cardiologist and Ayurveda physician) for face validity. The instrument was informally pretested during the first two camps for comprehensibility, and minor wording adjustments were carried forward. Formal forward-backward translation by an independent translator and formal psychometric validation (internal consistency, testretest reliability) of the awareness composite were not performed. The awareness composite is therefore presented descriptively (0–3 ordinal index) rather than as a validated scale, and the principal analytic claim in Axis 1 is supported by each item considered individually as well as by the composite (Supplementary Table S2). The full questionnaire (English and Hindi) is provided as Supplementary Material S3.

Statistical Analysis: Characteristics were summarised as mean (SD), median [IQR], or n (%). With 458 participants, a 13% proportion is estimated with a 95% confidence interval half-width of approximately ±3.1%, providing adequate descriptive precision; no formal a priori power calculation was performed as the study was hypothesis-generating for the concordance analyses. Three pre-specified analyses, one per subjective channel, addressed the central hypothesis.

Axis 1 (Awareness): Multivariable logistic regression modelled heard of metabolic syndrome on age (per 10 years), sex, education (illiterate / school / graduate / postgraduate), residence area (urban / peri-urban / rural), central obesity, and screen-positive elevated BP. The pre-specified test was whether the objective markers predicted awareness independently of demographic factors. Because the postgraduate stratum was sparse and produced quasi-separation under standard maximum likelihood (i.e., the maximum-likelihood estimator did not converge to a finite point), the primary model used Firth penalised likelihood [Firth's bias-reducing penalty (Jeffreys prior) keeps the estimator finite under sparsity and yields valid confidence intervals]. As a sensitivity analysis we re-estimated prevalence ratios using Poisson regression with robust (Huber-White / HC1) variance [when the outcome is common, odds ratios diverge from prevalence ratios; the Poisson-robust approach estimates the prevalence ratio directly without the convergence issues of log-binomial regression] [8].

Axis 2 (Symptoms): We computed the area under the receiver-operating-characteristic curve (AUC) of the unweighted symptom count against each objective marker. The AUC is the standard summary of discrimination of a continuous score against a binary outcome; an AUC of 0.50 indicates discrimination no better than chance. We accompanied each AUC by a 95% confidence interval estimated from 2,000 bootstrap resamples (seed 2026) [non-parametric resampling provides valid confidence intervals without distributional assumptions].

Axis 3 (Diagnosis): Treating measurement as the reference standard, we calculated the sensitivity, specificity, and positive predictive value of self-report, together with the proportion of measured-positive participants previously diagnosed.

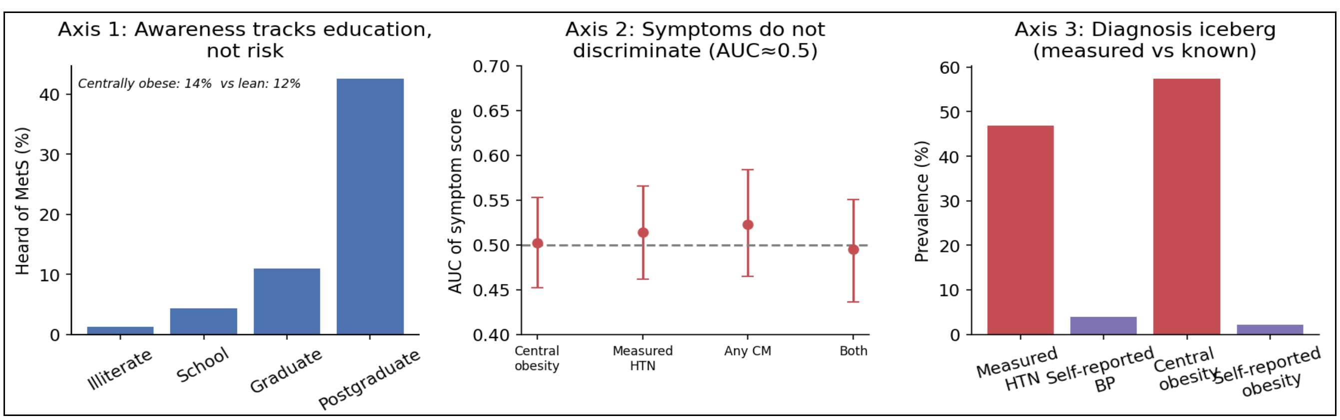

FIG. 1: THE THREE SILENCES OF CARDIOMETABOLIC RISK IN 458 CAMP-ATTENDING ADULTS, VARANASI DISTRICT, UTTAR PRADESH. (Left panel, *awareness vs risk*) Proportion who had heard of metabolic syndrome, stratified by objective risk (centrally obese 14.1% vs not 11.8%; screen-positive elevated BP 13.2% vs not 14.2%) and by education (illiterate, school, graduate, postgraduate). Awareness rises steeply with education but is essentially flat across objective risk strata. (Centre panel, *symptoms vs risk*) Receiver-operating-characteristic (ROC) curves for the 9-item self-perceived symptom score against each objective marker; AUC values 0.50 to 0.52, all 95% confidence intervals crossing the dashed line of no discrimination. (Right panel, *diagnosis iceberg*) Bar comparison of objectively measured prevalence (central obesity 57.4%, screen-positive elevated BP 46.8%) versus prior-diagnosis self-report prevalence (2.2% and 3.7% respectively). Available in PNG, SVG and TIFF formats at ≥600 dpi.

Cohen's κ was reported as a secondary chance-corrected agreement statistic; because the self-reported and measured prevalences were markedly imbalanced, κ is interpreted with caution (κ is depressed by unequal marginal totals), and sensitivity is the primary concordance measure. Blood-pressure outcomes used complete cases (4.4% missing, plausibly missing-completely-at-random owing to field logistics). Analyses used Python 3.11 (stats models 0.14.6, scikit-learn, numpy); Firth estimation was implemented by penalised maximum likelihood. A two-sided α of 0.05 was applied. The three axes were treated as independent confirmatory questions and were not jointly corrected for multiplicity; within Axis 2, all four AUC intervals included 0.50 regardless of correction.

Ethics: The study was conducted in accordance with the Declaration of Helsinki. Ethics approval was granted by the Institutional Ethics Committee, Institute of Medical Sciences, Banaras Hindu University, Varanasi (reference no. IMS/IEC/APRIL/2026/402; approved 29 April 2026; DHR registration EC/NEW/INST/2023/UP/0257; DCGI registration ECR/526/Inst/UP/2014/RR-20). Written informed consent was obtained from all participants prior to enrolment.

RESULTS:

Sample Characteristics: The 458 adults had a mean age of 48.8 (SD 18.8) years; 221 (48.3%) were women **Table 1**. Most resided in urban areas (350; 76.4%), with peri-urban representation 63 (13.8%) and rural representation 45 (9.8%); 81 (17.7%) were illiterate and 194 (42.3%) were graduates or postgraduates.

The objective cardiometabolic burden was high: central obesity (WHR-defined) was present in 263 (57.4%), with mean WHR 0.92 (SD 0.16); screen-positive elevated blood pressure was present in 205 of 438 measured (46.8%); 361 (78.8%) had at least one of the two markers and 113 (25.8%) had both. In stark contrast, prior self-reported chronic-disease diagnosis was rare: hypertension 17 (3.7%), diabetes 11 (2.4%), obesity 10 (2.2%); only 29 (6.3%) were taking any regular medication.

TABLE 1: CHARACTERISTICS OF 458 COMMUNITY ADULTS ATTENDING HEALTH CAMPS IN AND AROUND VARANASI DISTRICT, UTTAR PRADESH: OBJECTIVE CARDIOMETABOLIC BURDEN VERSUS SUBJECTIVE AWARENESS, SYMPTOMS AND SELF-REPORTED DIAGNOSIS

Characteristic	Value
Age, mean (SD), years	48.8 (18.8)
Age 18–44 / 45–59 / ≥60, n (%)	190 (41.5) / 119 (26.0) / 149 (32.5)
Female, n (%)	221 (48.3)
Education, illiterate / school / graduate / postgraduate, n (%)	81 (17.7) / 183 (40.0) / 100 (21.8) / 94 (20.5)
Residence, urban / peri-urban / rural, n (%)	350 (76.4) / 63 (13.8) / 45 (9.8)
Objective markers	
BMI, mean (SD), kg/m²	25.3 (6.0)
Central obesity (WHR-defined), n (%)	263 (57.4)
Blood pressure measured, n	438
Mean systolic / diastolic BP, mmHg	128.7 / 79.8
Screen-positive elevated BP (≥140/90), n (%)	205/438 (46.8)
≥1 cardiometabolic marker, n (%)	361 (78.8)
Both markers, n (%)	113 (25.8)
Subjective channels	
Heard of metabolic syndrome, n (%)	60 (13.1)
Aware that risk factors cluster, n (%)	34 (7.4)
Believe lifestyle is principal driver, n (%)	114 (24.9)
Knowledge-attitude score 0 / 1 / 2 / 3, n	307 / 110 / 25 / 16
Any self-perceived symptom (≥1 of 9), n (%)	245 (53.5)
Symptom count, mean (SD)	1.27 (1.70)
Self-reported prior diagnosis of hypertension, n (%)	17 (3.7)
Self-reported prior diagnosis of diabetes, n (%)	11 (2.4)
Self-reported prior diagnosis of obesity, n (%)	10 (2.2)
Currently taking any regular medication, n (%)	29 (6.3)

Awareness was low and Unrelated to Objective Risk (Axis 1): Only 60 participants (13.1%) had ever heard of metabolic syndrome, 34 (7.4%) knew that risk factors tend to cluster, and 114 (24.9%)

believed lifestyle was a principal driver; 307 (67.0%) scored zero on the 0–3 knowledge-attitude composite **Table 1.** Crucially, awareness did not rise with objective risk. The proportion who had heard of metabolic syndrome was almost identical among the centrally obese and the non-obese (14.1% vs 11.8%) and among those with and without screen-positive elevated BP (13.2% vs 14.2%). In the Firth-penalised multivariable model (**Table 2**; n = 438), neither central obesity (adjusted OR 1.03, 95% CI 0.55 to 1.94, p = 0.92) nor screen-positive elevated BP (OR 0.95, 0.51 to 1.77, p = 0.88) was associated with awareness. Awareness was instead strongly graded by education (graduate vs illiterate OR 9.4, 1.7 to 53.7, p = 0.011; postgraduate vs illiterate OR 55.9, 10.5 to 296.8, p < 0.001) and was higher in women (OR 1.95, 1.05 to 3.64, p = 0.036). Robust-Poisson prevalence ratios were concordant in direction and significance (objective markers both p > 0.8), confirming that objectively measured risk carried no information about whether a person had heard of metabolic syndrome **Fig. 3.**

TABLE 2: DETERMINANTS OF HAVING HEARD OF METABOLIC SYNDROME (FIRTH-PENALISED MULTIVARIABLE LOGISTIC REGRESSION, N = 438)

Predictor	Adjusted OR	95% CI	p
Age, per +10 years	1.06	0.87 to 1.29	0.563
Female (vs male)	1.95	1.05 to 3.64	0.036
Education: school (vs illiterate)	3.30	0.58 to 18.60	0.177
Education: graduate (vs illiterate)	9.44	1.66 to 53.65	0.011
Education: postgraduate (vs illiterate)	55.86	10.51 to 296.80	<0.001
Residence: peri-urban (vs urban)	2.15	0.85 to 5.42	0.105
Residence: rural (vs urban)	0.45	0.15 to 1.37	0.159
Central obesity (WHR-defined)	1.03	0.55 to 1.94	0.920
Screen-positive elevated BP	0.95	0.51 to 1.77	0.878

Firth penalisation was used because the postgraduate stratum produced quasi-separation under standard maximum likelihood (i.e., the maximum-likelihood estimator did not converge to a finite point). Standard logistic regression and robust-Poisson prevalence ratios were concordant in direction and significance; the objective markers remained non-significant in every specification (both p > 0.8). BP, blood pressure; CI, confidence interval; OR, odds ratio; WHR, waist-hip ratio.

Self-perceived Symptoms did not discriminate Objective Risk (Axis 2): Although 245 participants (53.5%) reported at least one symptom (mean symptom count 1.27, SD 1.70), the unweighted symptom score had no ability to distinguish who actually carried cardiometabolic risk. The AUC was 0.50 (95% CI 0.45 to 0.55) for central obesity, 0.51 (0.46 to 0.57) for screen-positive elevated BP, 0.52 (0.47 to 0.58) for any marker, and 0.50 (0.44 to 0.55) for both. Every confidence interval encompassed the line of no discrimination **Fig. 2.** Self-perceived symptoms were, in effect, statistical noise with respect to measured risk.

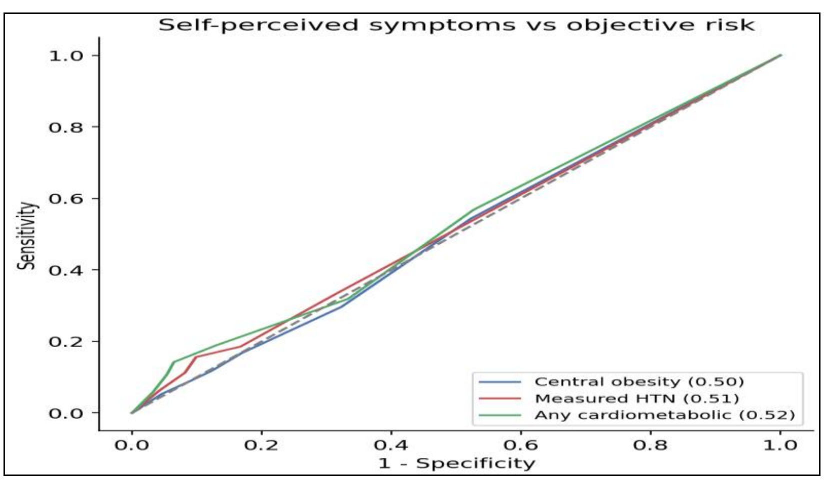

FIG. 2: RECEIVER-OPERATING-CHARACTERISTIC CURVES FOR THE 9-ITEM SELF-PERCEIVED SYMPTOM SCORE against objectively measured central obesity, screen-positive elevated blood pressure, any cardiometabolic marker, and both markers. All curves track the diagonal (AUC 0.50 to 0.52), indicating no discriminative information.

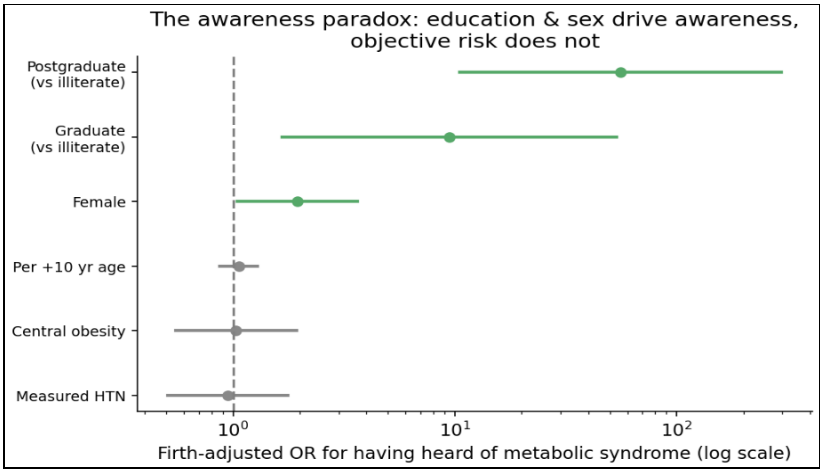

FIG. 3: THE AWARENESS PARADOX. Firth-adjusted odds ratios (log scale) and 95% confidence intervals for having heard of metabolic syndrome. Education (graduate, postgraduate vs illiterate) and female sex are strong independent predictors; objectively measured central obesity and screen-positive elevated blood pressure are not (both confidence intervals span 1.0).

TABLE 3: THE TRIPLE SILENCE: CONCORDANCE BETWEEN SUBJECTIVE CHANNELS AND OBJECTIVE CARDIOMETABOLIC MARKERS

Channel	Metric	Result
Awareness vs objective risk	Firth-adjusted OR, central obesity / elevated BP	1.03 / 0.95 (both not significant)
Self-perceived symptoms vs central obesity	AUC (95% CI)	0.50 (0.45 to 0.55)
Self-perceived symptoms vs screen-positive elevated BP	AUC (95% CI)	0.51 (0.46 to 0.57)
Self-perceived symptoms vs any marker	AUC (95% CI)	0.52 (0.47 to 0.58)
Prior-diagnosis self-report vs measured elevated BP	Sensitivity / specificity / proportion without prior recognition / Cohen's κ	2.9% / 95.3% / 97.1% / −0.02
Prior-diagnosis self-report vs measured central obesity	Sensitivity / specificity / proportion without prior recognition / Cohen's κ	2.7% / 98.5% / 97.3% / 0.01

AUC, area under the receiver-operating-characteristic curve; BP, blood pressure; CI, confidence interval.

Measured Disease was almost entirely Undiagnosed (Axis 3): Against measurement as the reference standard, prior-diagnosis self-report was almost completely insensitive. Of 205 participants with screen-positive elevated BP, only 6 reported any prior diagnosis of high blood pressure: sensitivity 2.9% (specificity 95.3%, positive predictive value 26.1%), so 97.1% were without prior recognition. Of 263 centrally obese participants, only 7 considered themselves to have obesity: sensitivity 2.7% (specificity 98.5%, positive predictive value 70.0%), leaving 97.3% without prior self-recognition. Agreement beyond chance was negligible (Cohen's κ = −0.02 for high BP and 0.01 for obesity); given the extreme imbalance between self-reported and measured prevalence, these κ values should be interpreted alongside the sensitivity estimates, which convey the same conclusion more directly: self-perceived status was effectively independent of measured status. Taken together **Fig. 1**, the three axes describe a single phenomenon: in this camp-based sample, the majority objectively carried cardiometabolic risk, yet that risk was conceptually unknown, symptomatically imperceptible, and clinically undiagnosed, a triple silence.

DISCUSSION: In a camp-based North Indian community sample in which more than half of adults were centrally obese and nearly half had screen-positive elevated blood pressure, cardiometabolic risk was invisible on every channel through which it might have been recognised. Awareness of metabolic syndrome was rare and, where present, was explained by education and sex rather than by actual risk; self-perceived symptoms carried no discriminative information; and virtually all measured disease was without prior recognition, with prior-diagnosis self-report detecting fewer than 3% of affected individuals. To our knowledge, this is the first community study to demonstrate this discordance simultaneously across all three channels in the same individuals.

Why this Study Matters: Each gap, taken alone, is familiar. Our contribution is to show that the gaps coincide and compound. The implication is strategic: because none of the three subjective channels detected the risk, interventions that depend on any single one of them will under-detect. Education campaigns presuppose that raising awareness reaches those at risk; in this sample, awareness was concentrated in the postgraduate-educated and essentially absent in the at-risk-but-unschooled, so untargeted messaging would widen, not close, the equity gap. Symptom-prompted care-seeking presupposes that people feel their risk; the symptom score discriminated no better than chance (AUC ≈ 0.50). Self-referral presupposes accurate self-recognition; self-report identified under 3% of measured disease. Only universal, measurement-based screening, delivered at the point of community contact under programmes such as NPCDCS and paired with immediate, literacy-appropriate communication, can plausibly surface a burden this silent within camp-attending populations.

Comparison with the Literature: Our objective prevalences are concordant with, and at the upper end of, national estimates: ICMR-INDIAB reported 35.5% hypertension and 39.5% abdominal obesity nationally [1], against 46.8% screen-positive elevated BP and 57.4% central obesity here. These differences plausibly reflect our older, predominantly urban camp-attending sample and single-visit BP ascertainment, and they should not be transported as population estimates without further work. Our prior-non-recognition fraction for elevated BP (97.1%) exceeds the 82% reported in rural Bangladesh [5] and the implied gaps from rural Indian screening, where one in five adults had newly detected hypertension [6]; the difference is consistent with a younger, less health-system-engaged subset of camp attendees screened opportunistically for the first time. Our awareness findings extend, rather than echo, prior Indian work: Verma *et al.* studied knowledge among patients already carrying a clinical diagnosis of metabolic syndrome and found average knowledge but poor practice [3], whereas we show that in the undiagnosed general camp-attending community the concept is largely unknown and, critically, unknown independently of who actually carries the risk. We are not aware of any prior report quantifying the discriminative value of self-perceived symptoms for metabolic syndrome at the individual level; the near-0.50 AUC operationalises the clinical truism that metabolic syndrome is "silent" as a measurable null in this setting.

Mechanistic Interpretation: The education gradient in awareness, divorced from any risk gradient, points to awareness as a marker of health literacy and information access rather than of bodily experience. That women were more aware despite men carrying comparable central-obesity burden may reflect greater health-system contact (reproductive and child-health services) rather than risk-driven learning. The symptom null is biologically expected: hypertension and central adiposity are asymptomatic until end-organ damage supervenes. Its demonstration here, in the same individuals in whom awareness and prior-diagnosis self-report also failed, is what closes the argument that no subjective channel is reliable for case-finding in this setting.

Limitations: Several limitations temper interpretation and should be read alongside the headline findings. First, no biochemistry (fasting glucose, triglycerides, or HDL cholesterol) was available, so we could not diagnose metabolic syndrome by ATP-III, IDF, or harmonised criteria; the objective construct was therefore restricted to two of the five MetS components (central obesity by WHR and screen-positive elevated BP), the two most amenable to camp-based community measurement. Second, blood pressure was measured on a single occasion (in duplicate), so the figures should be read as screen-positive elevated blood pressure rather than confirmed hypertension; a second-visit confirmation arm was not feasible within the camp model. Third, participants were a community convenience sample recruited at voluntary health camps, predominantly urban, with limited rural and peri-urban representation; camp attendees may differ systematically from non-attendees in motivation, health-system contact, and socio-economic profile, so the prevalence figures, and the magnitude of the awareness, symptom, and self-report gaps, should be read as descriptive of this camp-attending population rather than as population-representative estimates for North India. The concept of a triple silence is described in and for this population; generalisation to the wider community requires confirmation in probability-sample surveys, which we recommend as the next step. Fourth, the design is cross-sectional, so we cannot establish whether awareness, if raised, would change behaviour over time. Fifth, the awareness composite and symptom checklist were investigator-assembled and pretested for face validity but were not formally psychometrically validated (no documented forward-backward translation, no internal-consistency statistic); we mitigated this by reporting items individually as well as in composite form (Supplementary Table S2). Sixth, the primary self-report sensitivity uses the prior-physician-diagnosis question; sensitivity calculated against current-treatment or self-perception wording could yield different estimates and is provided in Supplementary Material S2. Finally, symptoms and prior diagnoses were self-reported; in this study self-report is the exposure of scientific interest rather than a measurement nuisance, so this is a feature rather than a limitation.

Future Directions: Programmes should test whether opportunistic measurement coupled to on-the-spot counselling outperforms awareness campaigns in converting silent risk into managed risk, and whether such screening narrows the education-related awareness inequity we observed. Linking a future survey wave with point-of-care fasting glucose and lipids would permit full metabolic-syndrome ascertainment and longitudinal tracking of the diagnosis-to-control cascade. A probability-sample replication, ideally with repeat-visit blood-pressure confirmation, is the natural next step.

CONCLUSIONS: In this camp-based community sample, the cardiometabolic risk carried by most adults was silent in three ways at once: they did not know the concept, they felt no different, and they had never been diagnosed. The little awareness that existed belonged to the educated rather than the affected. People at the highest measured risk cannot be expected to recognise it, feel it, or report it. Surfacing this hidden burden will require health systems to measure risk universally at the point of community contact and to communicate it in terms every patient can act on, rather than waiting for knowledge, symptoms, or self-recognition that this study shows will not come.

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Declarations: Ethics approval and consent to participate. The study was approved by the Institutional Ethics Committee, Institute of Medical Sciences, Banaras Hindu University, Varanasi (reference no. IMS/IEC/APRIL/2026/402; approved 29 April 2026; DHR registration EC/NEW/INST/2023/UP/0257; DCGI registration ECR/526/Inst/UP/2014/RR-20). The study was conducted in accordance with the Declaration of Helsinki, and written informed consent was obtained from all participants.

Consent for Publication: Not applicable. Availability of data and materials. The de-identified dataset analysed is available from the corresponding author on reasonable request.

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