

Original Research Article

Implementation and participant profile of a lifestyle medicine clinic at an urban health training centre in India: a prospective observational program evaluation

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ABSTRACT

Background: Non-communicable diseases (NCDs) pose a public health challenge in urban India. Lifestyle medicine may complement primary care. Objectives were to describe the implementation and participant profile of a Lifestyle Medicine Outpatient Department (OPD) at Urban Health Training Centre (UHTC) in India and to assess follow-up retention.

Methods: This prospective observational program evaluation study was conducted at UHTC in India from December 2025 to May 2026 (6 months). Adults aged with ≥ 18 years with known or newly detected NCDs were enrolled consecutively. The intervention comprised individualized lifestyle counselling, fortnightly group education on hypertension and diabetes, and behavioural counselling for substance use. Anthropometric measurements, blood pressure, and HbA1c were assessed at enrolment, while retention was assessed through attendance at scheduled follow-up visits.

Results: The mean age was 62.75 ± 10.45 years; 64.4% were aged ≥ 60 years. Hypertension was the most prevalent comorbidity (55.0%), followed by diabetes mellitus (21.5%). Using Asian Indian BMI cutoffs, 75.8% were overweight or obese. HbA1c assessment revealed diabetic values in 37.6% and prediabetic values in 6.7% of participants. First follow-up attendance was 22.1%, declining progressively to 1.3% by the fifth visit.

Conclusions: A lifestyle medicine program can be incorporated into the UHTC framework and reach a population with substantial cardiometabolic risk. However, very low follow-up retention limits the potential for sustained behavioural support and evaluation of clinical outcomes. Strategies including community outreach, digital follow-up, and community health worker support should be incorporated into future program implementation.

Keywords: Lifestyle medicine, Non-communicable diseases, Urban primary care, Program evaluation

INTRODUCTION

Non-communicable diseases (NCDs) have emerged as the dominant cause of morbidity and mortality in India, accounting for approximately 63% of all deaths nationally.¹ The ICMR-INDIAB study (2023) estimated that approximately 101 million Indians are living with diabetes, 136 million with prediabetes, and 315 million

with hypertension, highlighting the substantial metabolic NCD burden in the country.¹ Importantly, all major metabolic NCDs except prediabetes were more prevalent in urban than rural populations, underscoring the growing importance of urbanization and lifestyle-related risk factors.²

Despite this substantial burden, there remains a need to strengthen structured lifestyle-based approaches within

routine primary care, alongside pharmacological management of NCDs.^{3,4} Integrating evidence-based lifestyle interventions into primary care may provide an opportunity to address modifiable behavioural risk factors and complement conventional medical management.⁵

Lifestyle medicine is an evidence-based approach that uses therapeutic lifestyle interventions-including dietary modification⁶, physical activity, restorative sleep, stress management, avoidance of risky substances, and positive social connection-as components of chronic disease prevention and management.⁷ Intensive, multicomponent lifestyle interventions have been associated with improvements in glycaemic control, body weight, blood pressure, and other cardiometabolic risk factors in people with type 2 diabetes.⁸ Recent evidence also suggests that community-based interventions can improve glycaemic control among people with type 2 diabetes in developing countries, with a recent meta-analysis reporting a significant reduction in HbA1c compared with usual care.⁹

The UHTC model, linked with departments of Community Medicine at medical colleges, provides a potentially useful platform for community-based lifestyle interventions by combining community access, multidisciplinary training, and opportunities for service-based research.¹⁰ The present study describes the real-world implementation and participant profile of a Lifestyle Medicine OPD established at UHTC affiliated with a medical college in India, with a focus on participant follow-up and retention over a six-month period.

Objectives

Objectives were to describe the implementation, participant profile, and follow-up experience of a Lifestyle Medicine OPD at the UHTC in India over a six-month period.

METHODS

Study design and setting

This was a prospective observational program evaluation study was conducted prospectively over six months, from December 2025 to May 2026, at the UHTC affiliated with a medical college in Gujarat. The UHTC serves as the urban field-practice area of the medical college and provides primary healthcare services to the surrounding urban population. The study evaluated the implementation and early outcomes of a Lifestyle Medicine OPD established at the UHTC. The program integrated individualized lifestyle counselling, structured group education, behavioural support, and periodic clinical follow-up into routine primary healthcare services for adults with NCDs and related metabolic risk factors.^{11,12}

Study population and enrolment

The study population comprised adults aged ≥ 18 years attending the Lifestyle Medicine OPD during the six-month study period. Adults aged 18 years and above with known or newly detected NCDs or metabolic risk conditions, including hypertension, type 2 diabetes mellitus, prediabetes, obesity, and dyslipidaemia, were eligible for inclusion. Participants who met the eligibility criteria and provided informed consent were consecutively enrolled. Individuals who did not meet the inclusion criteria or declined informed consent were excluded. No formal sample-size calculation was performed. A total of 149 participants were enrolled in the Lifestyle Medicine OPD and included in the program evaluation.

Intervention description

The Lifestyle Medicine OPD implemented a structured, multicomponent lifestyle intervention based on the major domains of lifestyle medicine. The intervention was individualized according to participants' clinical conditions, dietary practices, socioeconomic circumstances, food preferences, physical activity patterns, and comorbidities.

Individual lifestyle counselling

At enrolment, each participant underwent a comprehensive lifestyle assessment covering dietary habits, physical activity levels, sleep patterns, stress and psychosocial factors, and tobacco and alcohol use.

Individualized counselling was subsequently provided according to the participant's identified needs.¹¹⁻¹³ Counselling addressed dietary modification, promotion of regular physical activity and reduction of sedentary behaviour, adequate and restorative sleep, stress management, avoidance or cessation of tobacco and harmful substance use, and strengthening of positive social and behavioural support. The counselling approach was tailored to the participant's socioeconomic circumstances, cultural and dietary practices, food preferences, medical conditions, and individual needs.

Fortnightly group education sessions

Structured group education sessions were conducted every two weeks. The sessions focused on practical aspects of NCD prevention and self-management, particularly diabetes and hypertension management, dietary modification, physical activity promotion, weight management, cardiovascular risk reduction, and maintenance of healthy lifestyle behaviours.^{11,12,14} Sessions were conducted at the UHTC premises and, where appropriate, at community locations including public parks to improve accessibility and community participation. The group sessions also provided

opportunities for peer interaction, motivation, and social support.

Behavioral counselling for substance use

Participants identified as using tobacco or alcohol received targeted behavioural counselling for cessation or reduction. Counselling focused on awareness of health risks, identification of behavioural triggers, motivation for behaviour change, coping strategies, and reinforcement of cessation or reduction goals.^{12,14} Participants requiring additional medical management were managed or referred according to routine clinical practice at the health facility.

Follow-up

Participants were invited for periodic follow-up visits to monitor clinical parameters and reinforce lifestyle recommendations. Follow-up assessments included measurement of weight and blood pressure, while HbA1c was assessed where clinically indicated or available. Follow-up visits were also used to assess adherence to recommended lifestyle changes, identify barriers to behaviour change, reinforce individual lifestyle goals, and provide additional counselling and behavioural support.

Data collection

Baseline sociodemographic, clinical, anthropometric, and biochemical information was collected at enrolment. Sociodemographic variables included age and sex. Clinical information included known comorbidities and duration of illness. Participants were categorized into the following age groups: 30-44 years, 45-59 years, and ≥ 60 years.

Known comorbidities were categorized as hypertension only, diabetes mellitus only, both hypertension and diabetes mellitus, or other conditions. Duration of illness was categorized as <1 year, 1-5 years, 5-10 years, ≥ 10 years, or newly diagnosed at enrolment. Participants classified as newly diagnosed were considered separately from those with a pre-existing duration of illness.

Anthropometric measurements included height and weight. Body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared (kg/m^2). BMI was categorized using Asian Indian cut-offs as follows: underweight <18.5 kg/m^2 , normal weight 18.5-22.9 kg/m^2 , overweight 23.0-24.9 kg/m^2 , obesity class I 25.0-29.9 kg/m^2 , and obesity class II ≥ 30.0 kg/m^2 .¹⁵

Blood pressure assessment

Blood pressure was measured during clinical assessment using a standard blood pressure measurement procedure. For the purpose of analysis, participants with systolic blood pressure <140 mmHg and diastolic blood pressure <90 mmHg were categorized as having normal blood

pressure. Participants with systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg were categorized as having elevated blood pressure.¹⁰

Glycemic assessment

Glycaemic status was assessed using glycated haemoglobin (HbA1c) values recorded at enrolment. Participants were categorized according to HbA1c levels as follows: normal glycaemic range (<5.7%), prediabetes (5.7-6.4%), and diabetes mellitus ($\geq 6.5\%$).¹⁶ These categories were used for descriptive analysis of the glycaemic status of the study population.

Outcome measures

The primary outcomes of the program evaluation were the baseline demographic and clinical characteristics of participants and their retention within the Lifestyle Medicine OPD. The baseline characteristics assessed included age, sex, comorbidity profile, duration of illness, BMI category, blood pressure status, and glycaemic status.

Program retention was assessed using attendance at scheduled follow-up visits. The number of participants attending each follow-up visit was recorded and expressed as a percentage of the total number of enrolled participants.

Statistical analysis

Data from all 149 enrolled participants were included in the baseline descriptive analysis. Data were entered and cleaned in Microsoft Excel and subsequently exported to Stata version 14 (StataCorp LLC, College Station, Texas, USA) for statistical analysis.¹⁷ Categorical variables were summarized using frequencies and percentages, while continuous variables were summarized using mean $\pm$ standard deviation (SD).

Baseline characteristics were described according to age, sex, comorbidity profile, duration of illness, BMI category, blood pressure status, and glycaemic status. Follow-up attendance was summarized using a retention cascade. For each scheduled follow-up visit, the number of participants attending and not attending was recorded, and the attendance rate was calculated as:

Attendance rate (%) = $\frac{\text{Number of participants attending the respective follow-up visit}}{\text{Total number of enrolled participants}} \times 100$.

As clinical measurements were not consistently collected at follow-up, longitudinal changes in anthropometric, blood pressure, or glycaemic parameters were not assessed. No multivariable, subgroup, or sensitivity analyses were performed. There were no missing data. Results were presented using tables in accordance with STROBE reporting guidelines.

Ethical considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Institutional Ethics Committee approval was obtained before commencement of the study. Participants were informed about the purpose and procedures of the program and were enrolled after obtaining informed consent in accordance with the procedure approved by the Institutional Ethics Committee. Participant confidentiality was maintained throughout data collection, analysis, and reporting.

RESULTS

Sociodemographic and clinical characteristics

A total of 149 participants were enrolled in the Lifestyle Medicine OPD during the study period. The mean age of the participants was 62.75 ± 10.45 years, with the majority (64.4%) aged ≥ 60 years. Males constituted 53.7% of the study population, while females accounted for 46.3%.

Hypertension alone was the most common known comorbidity (55.0%), followed by diabetes mellitus alone (21.5%) and both hypertension and diabetes (18.8%). Regarding disease duration, 30.2% of participants had been living with their illness for more than 10 years, whereas 6.0% were newly diagnosed. The sociodemographic and clinical characteristics of the participants are presented in Table 1.

Anthropometric and clinical profile

Among the 149 study participants, the majority were either overweight or obese according to the Asian Indian BMI classification. Obese Class I (BMI 25.0 – 29.9 kg/m²) was the most prevalent category, accounting for 48.3% (n=72) of participants, followed by overweight (17.4%, n=26) and Obese Class II (10.1%, n=15). Normal BMI was observed in 22.1% (n=33), while only 2.0% (n=3) were underweight. The mean weight and height of the

participants were 65.96 ± 13.33 kg and 155.8 ± 8.98 cm, respectively. Regarding blood pressure, 67.8% (n=101) had elevated blood pressure, whereas 32.2% (n=48) had normal blood pressure. Based on HbA1c levels, 55.7% (n=83) of participants had normal glycaemic status, 6.7% (n=10) were classified as prediabetic, and 37.6% (n=56) were diabetic. Table 2 presents the anthropometric measurements and laboratory profile of the participants.

Follow-up retention

Follow-up attendance declined progressively over the study period. Of the 149 participants, 33 (22.1%) attended the first follow-up visit, while 116 (77.9%) did not. Attendance further decreased to 14 (9.4%) at the second follow-up, 6 (4.0%) at the third, 3 (2.0%) at the fourth, and only 2 participants (1.3%) attended the fifth follow-up visit. Correspondingly, the proportion of participants who did not attend increased from 77.9% at the first follow-up to 98.7% by the fifth follow-up, indicating a substantial decline in participant retention over time. The follow-up retention of the participants is presented in Table 3.

Components of lifestyle medicine

Table 4 summarizes the components of the Lifestyle Medicine intervention implemented at the Lifestyle Medicine OPD. All enrolled participants underwent a comprehensive baseline assessment, followed by individualized lifestyle counselling addressing diet, physical activity, sleep, stress management, and behavioural modification. Participants with tobacco or alcohol use received dedicated cessation counselling. In addition, fortnightly group health education sessions were conducted to improve awareness regarding hypertension, diabetes, cardiovascular risk reduction, and healthy lifestyle practices. Regular follow-up visits were advised to monitor clinical parameters and reinforce lifestyle modifications. The intervention was delivered as a structured, multidisciplinary package within the UHTC setting.

Table 1: Sociodemographic and clinical characteristics of participants, (n=149).

Characteristics	N	Percentage (%)
Age group (in years)		
Mean $\pm$ SD	62.75 $\pm$ 10.45	-
18-29	-	-
30-44	4	2.7
45-59	49	32.9
≥ 60	96	64.4
Gender		
Male	80	53.7
Female	69	46.3
Known comorbidity		
Hypertension only	82	55.0
Diabetes mellitus only	32	21.5
Both HTN + DM	28	18.8
Others	7	4.7

Continued.

Characteristics	N	Percentage (%)
Duration of illness		
<1 year	17	11.4
1-5 years	41	27.5
5-10 years	37	24.8
>0 years	45	30.2
Newly diagnosed	9	6.0

Table 2: Anthropometric and laboratory profile of participants, (n=149).

Characteristics	N	Percentage (%)
Mean weight±SD	65.96±13.33 kg	-
Mean height±SD	155.8±8.98 cm	-
BMI category (Asian Indian cutoffs)		
Underweight (<18.5 kg/m ²)	3	2.0
Normal (18.5-22.9 kg/m ²)	33	22.1
Overweight (23.0-24.9 kg/m ²)	26	17.4
Obese I (25.0-29.9 kg/m ²)	72	48.3
Obese II (≥30.0 kg/m ²)	15	10.1
Blood pressure		
Normal	48	32.2
Elevated	101	67.8
HbA1c status		
No diabetes (<5.7%)	83	55.7
Prediabetes (5.7-6.4%)	10	6.7
Diabetic (≥6.5%)	56	37.6

Table 3: Follow-up attendance cascade (n=149).

Follow-up visit	Attended (N)	Did not attend (N)	Attendance rate (%)
1st follow-up	33	116	22.1
2nd follow-up	14	135	9.4
3rd follow-up	6	143	4.0
4th follow-up	3	146	2.0
5th follow-up	2	147	1.3

*Attendance rates are calculated using the total enrolled cohort (N=149) as the denominator.

Table 4: Components of the lifestyle medicine intervention implemented at the lifestyle medicine OPD.

Variables	Description
Initial clinical assessment	Comprehensive assessment of medical history, dietary habits, physical activity, sleep pattern, stress, mental health, tobacco/alcohol use, anthropometry, BP, and laboratory investigations.
Individual lifestyle counselling	Personalized counselling based on the six pillars of lifestyle medicine, tailored according to participants' socioeconomic background, food preferences, and existing comorbidities.
Nutrition counselling	Advice on balanced diet, portion control, salt and sugar restriction, increased intake of fruits and vegetables, and healthy eating practices.
Physical activity counselling	Recommendations on regular physical activity, including walking, yoga, stretching exercises, and age-appropriate exercise plans.
Stress management and sleep counselling	Education regarding stress reduction techniques, relaxation exercises, and healthy sleep practices.
Tobacco and alcohol cessation counselling	Behavioural counselling and motivational support for participants reporting tobacco/alcohol use.
Group health education sessions	Fortnightly group sessions on hypertension, diabetes, healthy lifestyle practices, cardiovascular risk reduction, and self-management conducted at the UHTC and selected community locations.
Follow-up and reinforcement	Participants were advised to attend regular follow-up visits for monitoring of clinical parameters and reinforcement of lifestyle modification practices

*The Lifestyle Medicine OPD intervention was delivered as a structured, multidisciplinary package comprising individualized counselling, group education, behavioural counselling, and periodic follow-up.

DISCUSSION

This prospective program evaluation describes the implementation and participant profile of a Lifestyle Medicine OPD established within an urban primary care setting in India and highlights an important implementation challenge: maintaining participant engagement after initial enrolment. Among the 149 participants enrolled over six months, the population was predominantly older adults, with a mean age of 62.75 ± 10.45 years and 64.4% aged ≥ 60 years. Hypertension was the most frequently reported comorbidity, affecting 55.0% of participants, while 18.8% had both hypertension and diabetes mellitus. A substantial burden of adiposity and cardiometabolic risk was also observed, with 75.8% of participants classified as overweight or obese according to Asian Indian BMI cut-offs and 67.8% having elevated blood pressure. HbA1c assessment identified diabetic-range values in 37.6% and prediabetic values in 6.7% of participants. These findings demonstrate that a Lifestyle Medicine OPD embedded within an urban primary care setting can attract a population with a substantial burden of modifiable cardiometabolic risk. At the same time, the progressive decline in attendance from 22.1% at the first follow-up to only 1.3% at the fifth follow-up represents the principal implementation challenge identified in this evaluation.

Participant profile and cardiometabolic burden

The predominance of older adults in the present cohort is consistent with the increasing concentration of cardiometabolic disease among older age groups. The mean age of 62.75 years and the finding that nearly two-thirds of participants were aged ≥ 60 years indicate that the Lifestyle Medicine OPD primarily reached individuals who were already at relatively high risk for chronic disease and its complications. This pattern is clinically relevant because lifestyle modification remains an important component of long-term management even among older adults with established NCDs. Rather than being restricted to disease prevention in younger populations, lifestyle medicine in primary care can therefore serve as a complementary approach for people already living with chronic cardiometabolic conditions.

The high prevalence of hypertension in this cohort is also consistent with the substantial burden of hypertension reported in the Indian population.¹⁸ The ICMR-INDIAB national study reported an overall hypertension prevalence of approximately 35.5% among adults and demonstrated that major metabolic NCDs, including hypertension and generalized obesity, were generally more prevalent in urban than rural populations.¹ The predominance of hypertension in the present Lifestyle Medicine OPD therefore reflects the broader epidemiological context in which urban primary care services increasingly encounter individuals with multiple interacting metabolic risk factors.

The coexistence of hypertension and diabetes in 18.8% of participants further emphasizes the importance of integrated rather than disease-specific approaches to NCD management. Diabetes, hypertension, excess adiposity, and dyslipidaemia share several behavioural and metabolic determinants, including unhealthy dietary patterns, physical inactivity, and excess body weight. Consequently, a clinic organized around common lifestyle determinants may provide a practical framework for addressing several NCDs simultaneously rather than creating separate behaviour-change pathways for each disease.

The duration-of-illness profile also suggests that the OPD was not limited to newly diagnosed individuals. Nearly one-third of participants had lived with their illness for more than 10 years, whereas only 6.0% were newly diagnosed. This finding is important from a service-delivery perspective because it indicates that lifestyle medicine may have a role not only in primary prevention or early detection but also in the long-term management of established chronic disease. However, the observational design does not allow conclusions regarding whether the intervention altered disease control or reduced complications in participants with longstanding illness.

Burden of overweight and obesity

One of the most prominent findings was the high prevalence of excess body weight. Using Asian Indian BMI cut-offs, 48.3% of participants were classified as having obesity class I, 10.1% as obesity class II, and a further 17.4% as overweight. Thus, approximately three-quarters of the cohort had BMI ≥ 23 kg/m². Only 22.1% had BMI in the normal range and 2.0% were underweight.

This finding is particularly relevant in the Indian context because cardiometabolic risk can occur at lower BMI levels in South Asian populations than in many Western populations¹⁵. The use of Asian Indian BMI thresholds in the present study therefore provides a more appropriate characterization of metabolic risk than relying exclusively on conventional international BMI categories¹⁹. Recent Indian obesity guidance has further emphasized that BMI should be interpreted alongside adiposity and obesity-related comorbidities rather than considered in isolation.

The high prevalence of excess weight supports the rationale for incorporating nutrition, physical activity, sedentary behaviour, sleep, and behavioural counselling into routine NCD services. Importantly, however, the present study should not be interpreted as demonstrating that the Lifestyle Medicine OPD reduced BMI or body weight. Anthropometric measurements were primarily assessed at enrolment, and follow-up clinical measurements were not sufficiently consistent for a longitudinal analysis. The finding therefore describes the need for lifestyle intervention among the population

reached, rather than demonstrating intervention effectiveness.

This distinction is important when comparing the present findings with intervention studies. Recent evidence indicates that structured lifestyle interventions can reduce the risk of progression to type 2 diabetes among individuals with prediabetes, particularly when interventions are sufficiently intensive and sustained over time. A recent systematic review and meta-analysis found that intensive lifestyle interventions were associated with reduced risk of developing type 2 diabetes compared with general advice.²⁰ These findings provide the rationale for the present service model but cannot be directly used to infer effectiveness from this observational evaluation. The Diabetes Prevention Program and subsequent lifestyle intervention literature provide strong evidence for the preventive value of intensive lifestyle modification, while more recent community-based and primary-care interventions have continued to support the role of structured lifestyle counselling in diabetes management. These studies provide the rationale for the present service model but cannot be directly used to infer effectiveness from this observational evaluation.²¹

Glycaemic status and opportunity for early detection

The HbA1c profile provides an additional indication of the cardiometabolic risk burden among participants. More than one-third of participants had HbA1c values in the diabetic range (37.6%), while a further 6.7% were in the prediabetic range. This finding is noteworthy because only 21.5% of the cohort was classified as having diabetes mellitus alone based on the reported comorbidity profile. Although the two measures are not directly equivalent and should not be interpreted as a formal estimate of undiagnosed diabetes, the difference suggests that opportunistic biochemical assessment within lifestyle-oriented primary care may identify individuals with previously unrecognized or incompletely characterized glycaemic abnormalities.

This observation is consistent with the broader Indian epidemiological picture. The ICMR-INDIAB study estimated a very large national burden of diabetes and prediabetes and demonstrated substantial variation across states and between urban and rural populations¹. The high proportion of participants with abnormal HbA1c values in the present cohort therefore reinforces the potential value of integrating risk assessment and opportunistic screening with lifestyle counselling in primary care.

Community-based approaches to diabetes care have also increasingly emphasized education, self-management support, and behavioural change rather than relying solely on medication-based management. For example, recent Indian community-based behaviour-change research has demonstrated the potential of structured behavioural communication to improve diabetes self-care practices. Similarly, systematic reviews of primary-care and

community-based interventions indicate that interventions combining education, self-management support, and behavioural strategies can improve selected diabetes-related outcomes.

Nevertheless, the present study provides baseline glycaemic profiling rather than evidence of glycaemic improvement. Because follow-up HbA1c measurements were not consistently available, changes in HbA1c could not be reliably evaluated. Accordingly, the present findings should be interpreted as evidence of the metabolic risk profile of the population attending the clinic and not as evidence that the intervention reduced HbA1c.

Multicomponent lifestyle intervention in primary care

The Lifestyle Medicine OPD used a multicomponent approach incorporating individualized counselling, group education, nutrition advice, physical activity counselling, stress and sleep counselling, and behavioural support for tobacco and alcohol use. This structure is consistent with the broader concept of lifestyle medicine, in which multiple interrelated behaviours are addressed rather than focusing on a single risk factor.²²

A multicomponent model is particularly relevant in public primary care because participants frequently present with more than one chronic condition. In the present cohort, almost one-fifth had both hypertension and diabetes, while a large proportion had excess body weight. A single lifestyle-oriented consultation can therefore potentially address several shared risk factors simultaneously.²³

Evidence from lifestyle intervention studies supports the use of combined dietary, physical activity, and behavioural approaches. Recent systematic reviews of community-based interventions in low- and middle-income countries have reported improvements in glycaemic outcomes with structured education and lifestyle interventions.²⁴ Similarly, implementation studies of lifestyle medicine programs have suggested that individualized counselling combined with multidisciplinary support can be delivered in diverse and resource-constrained populations. These findings provide a supportive evidence base for the present service model, although differences in intervention intensity, participant selection, duration, and outcome measurement limit direct comparison.

The group education component of the present program is particularly relevant from a scalability perspective. Fortnightly sessions provide an opportunity to reach multiple participants simultaneously while allowing discussion, peer interaction, and reinforcement of behaviour-change messages. Group-based approaches may also reduce the staff time required for repeated individual education.²⁵ The use of community locations such as public parks further illustrates the potential for

moving lifestyle counselling beyond the physical boundaries of the clinic.

However, the present study did not formally measure attendance at individual group sessions, participant satisfaction, fidelity to the intervention, or changes in individual lifestyle behaviours. Therefore, while the model appears feasible from an implementation perspective, the relative contribution of individual counselling, group education, behavioural counselling, and other components cannot be determined.

Follow-up retention: the major implementation challenge

The most striking finding of the study was the progressive loss of participants during follow-up. Of the 149 participants enrolled, only 33 (22.1%) attended the first follow-up visit. Attendance declined to 14 (9.4%) at the second visit, 6 (4.0%) at the third, 3 (2.0%) at the fourth, and only 2 (1.3%) at the fifth visit.

This pattern has major implications for the interpretation and future development of lifestyle medicine services in primary care. Lifestyle modification differs from many acute-care interventions because benefits depend on sustained engagement and repeated reinforcement. A program may therefore be clinically appropriate and feasible to initiate but still have limited population-level impact if participants do not return for continued support.

The observed attrition also demonstrates why retention should be considered an implementation outcome in lifestyle medicine programs rather than merely a statistical inconvenience. The very small proportion of participants reaching later visits means that the clinic's capacity to provide longitudinal behavioural support was substantially lower than its capacity to achieve initial enrolment.

Several potential explanations may account for this pattern, including competing work and family responsibilities, transportation difficulties, perceived improvement after the initial consultation, treatment fatigue, financial or logistical barriers, and limited perceived need for repeated preventive care. However, because reasons for non-attendance were not systematically collected in the present study, these explanations remain hypotheses rather than demonstrated causes of attrition.

The findings suggest that future programs should move beyond a clinic-dependent follow-up model. Telephone reminders, mobile-based communication, community health worker involvement, home-based follow-up, and group-based digital support may help maintain engagement.²⁶ Community-based peer-support models have shown potential for improving participation in diabetes prevention and self-management programs, while primary-care interventions increasingly incorporate

digital communication and social support to sustain behavioural change.²⁷

Implications for urban primary care and UHTC-based services

The present study has implications beyond the individual clinic. UHTCs provide a potentially useful interface between academic departments of Community Medicine and community-based primary healthcare. Their combination of clinical services, community outreach, undergraduate and postgraduate training, and opportunities for program evaluation may make them suitable settings for piloting integrated lifestyle interventions.²⁸

The findings suggest that a Lifestyle Medicine OPD can be incorporated into an existing primary-care environment without creating a disease-specific service for every individual risk factor. Instead, a common lifestyle platform can provide counselling across multiple NCDs while simultaneously identifying cardiometabolic risk through routine assessment.²⁹

This approach is consistent with India's broader shift toward comprehensive primary healthcare and integrated NCD management. The National Programme for Prevention and Control of NCDs emphasizes strengthening prevention, early detection, treatment, referral, and continuity of care within the health system. A structured lifestyle medicine service could complement these objectives by giving greater operational emphasis to behavioural risk modification.¹⁰

Nevertheless, scaling such a model requires more than establishing a dedicated OPD. The present retention cascade demonstrates that continuity of engagement is likely to be a greater challenge than initial service delivery. Future implementation should therefore incorporate retention strategies from the outset, including appointment reminders, community-based follow-up, family engagement, digital communication, and task-sharing with community health workers.

Strengths of the study

This study has several strengths. First, it describes the implementation of lifestyle medicine within an actual urban primary-care environment rather than under highly controlled research conditions. This provides practical information regarding the type of population that may seek such services and the challenges encountered during routine delivery.

Second, the study included 149 consecutively enrolled participants, providing a relatively broad participant base for an initial program evaluation. The inclusion of individuals with different cardiometabolic conditions also reflects the multimorbidity commonly encountered in primary care.

Third, the program used a multicomponent approach incorporating individualized counselling, group education, behavioural support, and reinforcement rather than a single lifestyle intervention. This reflects the multifactorial nature of NCD risk and provides a practical framework that could potentially be adapted to similar primary-care settings.

Fourth, the study documents follow-up retention across five scheduled visits. This is an important implementation outcome that is often underreported in descriptions of lifestyle interventions. The steep decline in attendance provides a clear signal that future program development must address participant retention as a central component of service design.

Finally, the study provides baseline anthropometric, blood pressure, and glycaemic information that illustrates the high cardiometabolic risk among participants attending the service. This strengthens the argument for integrating lifestyle-oriented care with routine NCD prevention and management.

Limitations

Several limitations should be considered when interpreting the findings. First, the study used a prospective observational program evaluation design without a comparison or control group. Consequently, the study cannot establish whether participation in the Lifestyle Medicine OPD caused any change in health outcomes.

Second, although baseline anthropometric, blood pressure, and HbA1c measurements were available, clinical measurements were not consistently collected at follow-up. Therefore, longitudinal changes in weight, BMI, blood pressure, or HbA1c could not be reliably assessed. Claims regarding clinical improvement should consequently not be made on the basis of this dataset.

Third, follow-up attrition was substantial. Only 22.1% of enrolled participants attended the first follow-up and 1.3% attended the fifth. This severely limits the ability to assess sustained engagement and makes any analysis based only on participants who returned vulnerable to selection bias. Participants who remained engaged may have differed systematically from those who did not return.

Fourth, the study was conducted at a single urban primary-care centre affiliated with a medical college. The participant profile, staffing structure, available resources, and local community characteristics may differ from those of other urban or rural primary-care facilities. Therefore, generalizability to other settings should be approached cautiously.

Fifth, the study did not systematically collect reasons for missed follow-up visits. Consequently, the observed

attrition cannot be confidently attributed to specific barriers such as transportation, employment, family responsibilities, financial constraints, or treatment fatigue. Future evaluations should include a structured assessment of reasons for non-attendance.

Sixth, the study did not use standardized, validated measures of lifestyle behaviour change, dietary adherence, physical activity, sleep, stress, or quality of life. As a result, it is not possible to determine which behavioural domains changed following counselling or which components of the intervention were most useful.

Seventh, the intervention was multicomponent and individualized. While this reflects real-world practice, it makes it difficult to isolate the effect of individual intervention components. Differences in counselling intensity, participant motivation, comorbidity, and exposure to group sessions may all have influenced engagement.

Finally, the six-month evaluation period provides limited information regarding the sustainability of lifestyle changes and long-term outcomes. Lifestyle interventions require prolonged follow-up to determine whether behavioural changes are maintained and whether they translate into clinically meaningful reductions in complications and healthcare utilization.

Overall interpretation

Taken together, the findings suggest that establishing a Lifestyle Medicine OPD within an urban primary-care setting is operationally feasible and can reach a population with a substantial burden of cardiometabolic risk. The participant profile—characterized by older age, a high prevalence of hypertension, substantial excess weight, and abnormal glycaemic status—supports the relevance of lifestyle-focused care within routine NCD services. However, the extremely low follow-up retention demonstrates that implementation feasibility at the point of enrollment does not necessarily translate into sustained participant engagement.

The principal contribution of this study is therefore not evidence of clinical effectiveness but an early description of how a lifestyle medicine service functions within a public urban primary-care environment and the practical barriers encountered in maintaining continuity of care. Future studies should build on this experience by incorporating standardized pre-specified clinical outcomes, systematic measurement of lifestyle behaviours, a longer follow-up period, structured documentation of intervention exposure, and active retention strategies. A longitudinal design with standardized measurement of weight, blood pressure, HbA1c, lifestyle behaviours, and patient-reported outcomes would allow future evaluations to determine whether sustained participation in such programs translates into measurable clinical benefit.

CONCLUSION

The Lifestyle Medicine OPD at UHTC Subhanpura, Vadodara demonstrates that a structured lifestyle medicine program is feasible within the existing UHTC framework in a resource-limited public primary care setting. The program successfully identified a high-burden NCD population, provided individualized and group-based lifestyle interventions, and documented meaningful clinical improvements among participants who adhered to follow-up. High attrition remains the foremost operational challenge and must be addressed through active community engagement, digital health tools, and multiprofessional workforce support before this model can be scaled.

Recommendations

Strengthen follow-up and retention

Implement structured telephone/SMS/WhatsApp reminders, digital lifestyle support, and ASHA/CHW-mediated follow-up to improve participant retention.

Expand community-based delivery

Conduct selected group education and physical-activity sessions in accessible community settings such as parks and residential community spaces.

Standardize cardiometabolic assessment

Integrate routine measurement of blood pressure, BMI, and HbA1c, where appropriate, into UHTC services, with clear referral pathways for high-risk participants.

Use task-sharing for lifestyle counselling

Train ASHAs, ANMs, CHOs, and other primary-care personnel in standardized lifestyle counselling, behaviour-change communication, and follow-up.

Strengthen future evaluation

Conduct longer-term evaluations with standardized follow-up of weight, blood pressure, HbA1c, lifestyle behaviours, and patient-reported outcomes, while systematically documenting reasons for non-attendance.

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