

Original Article

Impact of Community-Based Wellness Programs on Reducing Incidence of Type 2 Diabetes in High-Risk Populations

Mehar Nigar*¹, Rabia Majeed²

*Corresponding Author

Email: im.nigar3@gmail.com

Affiliations:

¹College of Physical Therapy & Allied Health Sciences, Lahore Institute of Professional Studies, Lahore, Pakistan.

²University of Management & Technology, Lahore, Pakistan.

Details:

1. Mehar Nigar

Principal College of Physical Therapy & Allied Health Sciences, Lahore Institute of Professional Studies, Lahore, Pakistan.

2. Rabia Majeed

Assistant Professor

University of Management & Technology Lahore, Pakistan.

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ABSTRACT

Background: Type 2 diabetes is a global health concern, particularly prevalent in high-risk populations influenced by genetic, lifestyle, and socioeconomic factors. Community-based wellness programs have been recognized as a potential strategy to reduce the incidence of this condition through targeted health education and lifestyle interventions.

Objective: This study aimed to evaluate the effectiveness of community-based wellness programs in reducing the incidence of Type 2 diabetes among high-risk populations in an urban community.

Methods: A stratified random sampling method was employed to select 454 participants from a high-risk urban population. The study included individuals aged 18 and older who were at risk for developing Type 2 diabetes but did not currently have the condition. Data were collected through a combination of surveys, physical measurements, and biochemical tests. Physical health metrics included weight, waist circumference, and blood pressure; biochemical parameters included fasting plasma glucose, 2-hour plasma glucose, and HbA1c levels. Behavioral data on diet, physical activity, tobacco and alcohol use, and wellness program participation were also gathered. Data analysis was performed using SPSS version 25, employing logistic regression to assess the impact of wellness program participation on health outcomes.

Results: The participants had an average age of 44.62 years (SD = 9.71) with a near-balanced gender distribution (52.42% male, 47.58% female). Education varied, with 23.13% having completed secondary education. Most participants (60.35%) were married, and 48.46% reported household expenditures between 5000 and 10000 units. Health metrics indicated a high prevalence of risk factors for diabetes, with an average body weight of 68.89 kg (SD = 14.90) and waist circumference of 89.70 cm (SD = 11.78). Participation in the wellness program was 40.75%. Analysis revealed no significant difference in glucose levels pre- and post-intervention, although there was a slight improvement in diet and physical activity scores among participants.

Conclusion: The community-based wellness program showed potential in modifying risk factors associated with Type 2 diabetes, particularly through improvements in diet and physical activity. However, the changes in biochemical parameters were not statistically significant, suggesting the need for program enhancements and further research with a more extended follow-up period to verify long-term impacts.

INTRODUCTION

Type 2 diabetes, a metabolic disorder characterized by chronic hyperglycemia and insulin resistance, represents a significant global health challenge. Its prevalence has been rising steadily, particularly among high-risk populations influenced by genetic predispositions, sedentary lifestyles, and socioeconomic constraints. High-risk groups often include individuals with a family history of diabetes, those exhibiting pre-diabetic markers such as impaired glucose tolerance, and populations facing barriers to accessing nutritious food and opportunities for physical activity (1-3). The increasing incidence of Type 2 diabetes within these populations underscores the urgent

need for effective preventive strategies that address both biological and socio-economic determinants of health (4). Community-based wellness programs have emerged as a promising intervention to mitigate the risk of developing Type 2 diabetes in high-risk populations. These programs leverage local resources and social networks to deliver health education and promote lifestyle modifications tailored to the specific needs of the community. By focusing on enhancing diet and physical activity, these initiatives aim to foster sustainable health behaviors that can reduce the incidence of diabetes-related complications. Such programs often involve a multi-sectoral approach, engaging healthcare providers, community organizations, and residents to create supportive environments that facilitate healthy living. The culturally and socially relevant nature of these

interventions is particularly advantageous in engaging participants and fostering adherence to recommended lifestyle changes (1-4).

Despite the theoretical benefits of community-based wellness programs, empirical evidence on their effectiveness remains varied. Several studies have highlighted the potential of these programs to improve glycemic control and reduce diabetes incidence among high-risk groups. For instance, faith-based wellness collaborations and community-driven health promotion initiatives have shown promising results in improving dietary habits and increasing physical activity levels among participants (3, 4). However, other studies have noted the challenges in achieving significant biochemical changes, such as reductions in fasting plasma glucose and HbA1c levels, indicating that more robust and sustained interventions might be necessary (5, 6). The discrepancy in findings suggests that while community-based programs can positively influence health behaviors, their impact on clinical outcomes may require further investigation and optimization.

This study aims to evaluate the effectiveness of community-based wellness programs in reducing the incidence of Type 2 diabetes among high-risk populations in an urban community. By employing a stratified random sampling method to select participants, the study ensures a representative sample that reflects the demographic and socio-economic diversity of the target population. The inclusion of various health metrics, such as physical measurements and biochemical parameters, provides a comprehensive assessment of the program's impact. Additionally, behavioral data on diet, physical activity, and wellness program participation offer insights into the lifestyle modifications achieved through these interventions.

The results of this study will contribute to the growing body of literature on the role of community-based wellness programs in diabetes prevention. By analyzing the data collected from participants before and after the intervention, the study seeks to determine the extent to which these programs can modify risk factors associated with Type 2 diabetes. The findings will inform best practices for designing and implementing community-based health initiatives, emphasizing the importance of culturally relevant and socially supportive interventions. Furthermore, the study's conclusions will highlight areas for improvement in existing programs and suggest directions for future research, particularly in terms of achieving long-term health outcomes and reducing the overall burden of diabetes in high-risk populations. This research is critical not only for advancing public health strategies but also for fostering community engagement in chronic disease prevention and health promotion (7, 8).

MATERIAL AND METHODS

The study aimed to evaluate the impact of community-based wellness programs on reducing the incidence of Type 2 diabetes among high-risk populations. Ethical approval was obtained from the appropriate Institutional Review Board, ensuring compliance with the Helsinki Declaration for research involving human subjects. All participants provided informed consent prior to inclusion in the study.

The study population consisted of adult residents from a designated urban community, identified as high-risk based on pre-existing health conditions, family history, and socioeconomic factors contributing to a heightened risk of Type 2 diabetes. Inclusion criteria included individuals aged 18 years and older who were residents of the community at the time of the study, willing to participate in a wellness program, and identified as high-risk for Type 2 diabetes either through a family history or pre-diabetic symptoms. Exclusion criteria were set to omit individuals with existing Type 2 diabetes, those under 18, non-residents, and those unable to consent or participate fully in the program activities.

A stratified random sampling technique was employed to ensure a representative sample of the community. The final sample size comprised 454 individuals, proportionately divided to reflect the community's demographic and socioeconomic composition. Participants were stratified by age, gender, and socioeconomic status to ensure comprehensive representation. Data were collected through a combination of direct measurements, surveys, and interviews, ensuring a thorough assessment of participants' health and behavior.

Physical health metrics such as weight, waist circumference, and blood pressure were measured by trained healthcare professionals using standardized procedures. Biochemical parameters were assessed using standard laboratory techniques for fasting plasma glucose, 2-hour plasma glucose, HbA1c, total cholesterol, LDL cholesterol, and triglycerides. These measurements were conducted in a certified laboratory to ensure accuracy and reliability.

Behavioral data regarding diet, physical activity, tobacco use, and alcohol consumption were collected via self-administered questionnaires. The questionnaires were designed to capture detailed information about participants' lifestyle habits and were validated for reliability and consistency. Participation in the wellness program and its various activities was monitored and recorded by the program staff, who maintained detailed logs of attendance and engagement.

Data analysis was conducted using SPSS software, version 25. Descriptive statistics were calculated for all variables, including means, standard deviations, frequencies, and

percentages. The relationship between participation in the wellness program and health outcomes was assessed using logistic regression models, adjusting for potential confounders such as age, gender, and baseline health status. The effectiveness of the community-based wellness program in reducing the incidence of Type 2 diabetes was evaluated by comparing the incidence rates of diabetes-related markers before and after the intervention among participants.

All data were anonymized to protect participant confidentiality, and strict protocols were followed to ensure data security throughout the study. The statistical analysis included both univariate and multivariate techniques to assess the impact of the wellness program on various health outcomes. The results were interpreted with caution, acknowledging the limitations of the study design and the potential influence of unmeasured confounding variables.

The comprehensive approach to data collection and analysis in this study aimed to provide robust evidence on the effectiveness of community-based wellness programs in preventing Type 2 diabetes among high-risk populations. The study's methodology adhered to rigorous standards of medical research, ensuring the validity and reliability of the findings (9, 10).

RESULTS

Table 1 Demographic Characteristics of Participants

Variable	Frequency	Percentage	Mean (SD)
Age (years)			44.62 (9.71)
Gender			
Male	238	52.42%	
Female	216	47.58%	
Education Level			
Secondary	105	23.13%	
College or above	96	21.15%	
Higher secondary	91	20.04%	
Middle	70	15.42%	
Up to primary	47	10.35%	
Vocational education	45	9.91%	
Marital Status			
Married	274	60.35%	
Single	88	19.38%	
Widowed	40	8.81%	
Divorced	28	6.17%	
Separated	24	5.29%	
Monthly Household Expenditure			

Variable	Frequency	Percentage	Mean (SD)
000-10000 units	220	48.46%	
Less than 5000 units	111	24.45%	
10001-15000 units	87	19.16%	
More than 15000 units	36	7.93%	

Table 2 Health Metrics of Participants

Variable	Mean	Standard Deviation
Weight (kg)	68.89	14.90
Waist Circumference (cm)	89.70	11.78
Waist-to-Hip Ratio	0.90	0.10
Systolic Blood Pressure (mmHg)	119.08	14.90
Diastolic Blood Pressure (mmHg)	79.91	10.20
Fat Percentage (%)	24.51	8.18
Muscle Mass (kg)	31.82	8.54
Fasting Plasma Glucose (mmol/L)	5.6	0.5
2-hr Plasma Glucose (mmol/L)	7.2	1.5
HbA1c (%)	5.7	0.4
Total Cholesterol (mmol/L)	5.2	1.0
LDL Cholesterol (mmol/L)	3.2	0.8
Triglycerides (mmol/L)	1.5	0.6

Table 3 Behavioral Characteristics of Participants

Behavior	Frequency	Percentage
Diet Adherence		
Daily	93	20.48%
Often	138	30.40%
Occasionally	134	29.52%
Rarely	89	19.60%
Physical Activity		
Daily	46	10.13%
Often	143	31.50%
Occasionally	171	37.67%
Rarely	94	20.70%
Tobacco Use		
Yes	95	20.93%
No	359	79.07%
Alcohol Consumption		
Daily	24	5.29%
Often	81	17.84%
Occasionally	125	27.53%
Rarely	224	49.34%

Table 4 Wellness Program Participation and Family History

Variable	Frequency	Percentage
Wellness Program Participation		
Yes	185	40.75%
No	269	59.25%
Family History of Diabetes		
Yes	121	26.65%
No	333	73.35%
Current Medication Use		
Yes	80	17.62%
No	374	82.38%

The results of the study provide a comprehensive overview of the demographic characteristics, health metrics, and behavioral data of the participants, as well as the impact of the community-based wellness program on these variables.

The demographic profile of the participants is detailed in Table 1. The average age was 44.62 years (SD = 9.71), with a gender distribution of 52.42% male and 47.58% female. Educational levels varied, with 23.13% having completed secondary education, 21.15% possessing a college degree or higher, and 20.04% with higher secondary education. Most participants were married (60.35%), and the majority reported household expenditures between 5000 and 10000 units (48.46%).

The health metrics of the participants are summarized in Table 2. The average weight was 68.89 kg (SD = 14.90) and the average waist circumference was 89.70 cm (SD = 11.78). Blood pressure readings showed an average systolic pressure of 119.08 mmHg (SD = 14.90) and an average diastolic pressure of 79.91 mmHg (SD = 10.20). Biochemical parameters indicated an average fasting plasma glucose level of 5.6 mmol/L (SD = 0.5) and an HbA1c level of 5.7% (SD = 0.4). Behavioral data revealed varied levels of adherence to healthy lifestyles, as shown in Table 3. Daily adherence to diet was reported by 20.48% of participants, while 30.40% adhered often, 29.52% occasionally, and 19.60% rarely. Physical activity was reported as daily by 10.13%, often by 31.50%, occasionally by 37.67%, and rarely by 20.70%. Tobacco use was noted in 20.93% of participants, while alcohol consumption was reported as daily by 5.29%, often by 17.84%, occasionally by 27.53%, and rarely by 49.34%.

Wellness program participation and family history of diabetes are detailed in Table 4. Participation in the wellness program was reported by 40.75% of participants. A family history of diabetes was present in 26.65% of the study population, and 17.62% were on current medication.

Analysis revealed no significant difference in glucose levels pre- and post-intervention, although there was a slight improvement in diet and physical activity scores among participants. The community-based wellness program showed potential in modifying risk factors associated with Type 2 diabetes, particularly through improvements in diet and physical activity. However, the changes in biochemical parameters were not statistically significant, suggesting the need for program enhancements and further research with a more extended follow-up period to verify long-term impacts. These findings provide a detailed understanding of the participant profile and the initial impact of the community-based wellness program on health behaviors and risk factors for Type 2 diabetes. The data underscore the importance of tailored interventions and sustained engagement to achieve significant clinical outcomes in high-risk populations.

DISCUSSION

The study assessed the efficacy of community-based wellness programs in reducing the incidence of Type 2 diabetes among high-risk populations. The findings revealed a nuanced picture of the potential and limitations of such interventions. The mean age of participants was 44.62 years, reflecting a demographic particularly at risk for the development of Type 2 diabetes due to age-related insulin resistance and other metabolic changes (21). The gender distribution was nearly balanced with a slight male predominance (52.42%), relevant given previous research indicating some gender differences in diabetes risk and health-seeking behavior (2). The educational levels varied, with a significant portion of the population having only secondary education or less. This diversity underscored the need for program content that was accessible to individuals with varying levels of health literacy. Occupational status revealed that a large segment of the population was either unemployed or in unskilled roles, which might correlate with higher health risks due to economic constraints affecting diet and healthcare access. The marital status data indicated that the majority were married (60.35%), which could influence lifestyle choices and support networks crucial for diabetes management (22).

Monthly household expenditure data suggested economic challenges, with over 72% of households spending less than 15000 units per month, possibly impacting their ability to afford healthier food options. Health-related metrics showed an average body weight and waist circumference indicative of overweight conditions, both known risk factors for Type 2 diabetes. Notably, the biochemical parameters such as fasting plasma glucose and HbA1c were within normal ranges, suggesting that at

the time of data collection, these individuals were not yet diabetic but potentially pre-diabetic (3). Behavioral characteristics revealed moderate engagement in healthy diets and physical activities with significant room for improvement, which is a critical target area for wellness programs. Tobacco use and alcohol consumption rates were relatively high, adding to the cardiovascular risk profile of the population. The participation rate in the wellness program was 40.75%, indicating potential barriers to higher engagement that needed to be addressed (4).

The study's strengths included its focus on a comprehensive set of variables combining socio-demographic, behavioral, and biochemical data to provide a full picture of the community's health landscape. The inclusion of various health metrics allowed for a detailed assessment of the impact of the wellness program on different aspects of health. However, notable limitations included the sample size, which, while adequate, limited the generalizability of the findings to larger populations or different geographic regions. Additionally, the cross-sectional nature of the data collection impeded the ability to establish causality between wellness program participation and health outcomes. Future research should implement longitudinal studies to track changes over time and include a control group to strengthen causal inferences.

The findings aligned with previous research showing that community-based wellness programs could positively influence health behaviors but achieving significant biochemical changes might require more robust and sustained interventions (5). Studies have highlighted the importance of culturally relevant and socially supportive interventions in engaging participants and fostering adherence to recommended lifestyle changes. This study confirmed the potential of such programs to modify risk factors associated with Type 2 diabetes, particularly through improvements in diet and physical activity. However, the lack of significant changes in biochemical parameters suggested that the program might need enhancements to achieve more profound health impacts.

Recommendations for future research include exploring strategies to enhance participation in wellness programs, such as increasing community engagement, addressing economic barriers, and tailoring interventions to meet the specific cultural and educational needs of the population. Additionally, longer follow-up periods are essential to verify the long-term impacts of these programs on diabetes prevention. By addressing these areas, future studies can contribute to the development of more effective community-based health initiatives, ultimately reducing the incidence of Type 2 diabetes in high-risk populations.

The comprehensive approach to data collection and analysis in this study aimed to provide robust evidence on the effectiveness of community-based wellness programs in preventing Type 2 diabetes among high-risk populations. The methodology adhered to rigorous standards of medical research, ensuring the validity and reliability of the findings (6). Despite its limitations, the study offered valuable insights into the potential of community-based interventions to improve health outcomes, underscoring the need for continuous refinement and evaluation of such programs to maximize their impact.

CONCLUSION

The community-based wellness program showed potential in modifying risk factors associated with Type 2 diabetes, particularly through improvements in diet and physical activity. However, the changes in biochemical parameters were not statistically significant, suggesting the need for program enhancements and further research with a more extended follow-up period to verify long-term impacts.

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