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Efficacy Of Family Participatory Intervention Strategies On Prevention Of Diabetes Among Prediabetic Individuals In Selected Rural Communities In Chennai

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Background: Diabetes mellitus is increasingly becoming a major public health problem worldwide, increasing concerns about the tangle diabetes will bring to the lives of more people both in affluent and in less affluent countries by WHO projections. **Aim:** The study aims to evaluate the efficacy of Family participatory intervention strategies on prevention of diabetes among prediabetic individuals. **Methods:** The study adopted a quasi-experimental one-group pretest-posttest design. Diabetic screening, based on HbA1c levels, was conducted among the general population of Thodukadu, identifying 150 individuals with prediabetes (HbA1c ranging from 5.7%

to 6.4%). From this pool, 100 participants were randomly selected using the lottery method. The selected participants were aged between 25 and 45 years and were confirmed to have prediabetes according to the inclusion criteria. To control for potential confounding variables, individuals with serious comorbidities such as cardiovascular disease or chronic kidney disease were excluded from participation.. **Finding:** The intervention demonstrated statistically significant improvements in participants' knowledge of prediabetes management ($p < 0.001$), as well as in key behavioral factors such as diet, physical activity, blood sugar monitoring, reduced smoking, decreased alcohol consumption, and increased physical activity ($p < 0.001$). Additionally, there were significant positive changes in key health outcomes, including reductions in BMI, blood glucose, and HbA1c levels. **Conclusion:** The study concluded that the family participatory intervention strategies employed were effective in enhancing knowledge, practices, and promoting lifestyle changes among individuals with prediabetes.

Key words: Diabetes, pre diabetic, family Participatory intervention, prevention.

INTRODUCTION

Diabetes mellitus has become a global health crisis, with the World Health Organization (WHO) estimating that the number of individuals affected by diabetes will reach 642 million by 2040.[1] Prediabetes, characterized by elevated blood glucose levels that do not yet meet the criteria for diabetes, represents a critical opportunity for intervention to prevent the progression to type 2 diabetes. [2,3]

In particular, family support is important to the self-management of diabetes especially among prediabetic individuals. Studies show family members exert very strong effects on health behaviors, both emotionally and practically facilitating dietary and exercise regimens. [4,5]

The integration of family dynamics into diabetes education programs can lead to improved adherence to treatment protocols and better health outcomes. [6,7] Furthermore, studies have shown that peer support and community engagement can significantly impact the effectiveness of diabetes management strategies. [8]

The effectiveness of family participatory interventions is also influenced by the socio-economic context of rural communities. Research indicates that socio-economic factors, such as income level and education, significantly impact diabetes management and health outcomes. In rural areas, where resources may be limited, tailored interventions that consider these socio-economic disparities are essential for success. [9,10]

New and effective intervention strategies are required to open new avenues for the treatment of increasing prevalence of diabetes, especially prediabetes among rural communities. Family participatory intervention strategies are a promising approach to diabetes prevention by serving to supplement self-management and health outcomes via the support of the family.

By analysing the existing literature and evidence, the researcher planned the study aims to evaluate the efficacy of Family participatory intervention strategies on prevention of diabetes among prediabetic individuals.

METHODOLOGY

The study employed a quasi-experimental design. The general public in Thodukadu underwent diabetic screening (HbA1c). The results identified 150 samples as prediabetic (HbA1c 5.7–6.4%). We selected 100 samples by simple random sampling using the lottery method. Participants in the study were between the ages of 25 and 45 years, met specific inclusion criteria, and had a diagnosis of prediabetes. To avoid confounding factors, we excluded people with other severe illnesses, such as cardiovascular disease or chronic kidney disease, from the study.

The Institutional Human Ethics Committee (IHEC) of Panimalar Medical College Hospital and Research Institute approved the study. Before participating, all participants had encountered the study objectives and procedures and provided written informed consent. This ensured that the study adhered to ethical standards when conducting research on human subjects.

We used demographic data, knowledge and practice questionnaires, a lifestyle modification tool, and HbA1c levels. The pretest was conducted initially. Family participatory intervention strategies included education on healthy habits, nutritional meal planning, and participation in regular group physical activities, which were provided to participants and their family members. Establishing collective health goals and personally monitoring blood sugar levels fosters self-accountability. Stress reduction techniques practiced as a family can enhance overall well-being and influence disease progression. We conducted Post-Test 1 at one month and Post-Test 2 at three months.

Statistical Analysis

The data was analysed using SPSS version 26. Demographic variables were presented using descriptive statistics (frequency and percentage) and statistical analysis comprised of paired t-tests, Wilcoxon Signed-Rank tests for pre-test, post 1 test and post 2 test. To assess change over time we used repeated measures ANOVA. The effectiveness of the intervention was indicated by a p value, $p < 0.05$, which was statistically significant. All analyses were performed with suitable statistical software.

RESULTS

Demographic variables

Table 1 showed that the majority of the participants in this study were between 36 and 40 years of age, and 50% of the participants were females. The majority of the respondents were working in the private sector, 46 percent, and had an income between INR 10,000 and 30,000 per month, 38 percent. Half of the participants were married and majority of them reported a

family history of diabetes, 58,%. The largest group concerning the place of residence was those who lived in rural areas (42%). About lifestyle habits, 50% of people never smoked; 33% reported alcohol consumption mostly seldom. Also, the largest number of respondents (29%) noted moderate intensity of physical activity, which includes exercise 3-4 times per week.

Knowledge and Practice:

Results showed significant improvement of participants' knowledge about prediabetes management in every measured area. The marked increase in understanding of prediabetes, healthy diet, physical activity, medication use, blood sugar monitoring risk factors, prevention practices, and complications occurred from pre test to post test 2. Significant improvement was shown within each category; p values were less than 0.001 indicating that the intervention indeed improved participants knowledge of how to manage prediabetes. (Table 2)

Like practice levels related to prediabetes management also saw substantial improvement. Between pretest and posttest 2, participants show improvement in adherence to diet plans, physical activity promotion, blood sugar monitoring, and taking medication (all $p < 0.001$). Furthermore, we found reductions in smoking ($p = 0.002$) and alcohol consumption ($p = 0.005$), positive behavioral changes that the intervention produced. (Table 3)

Life style Modification:

Lifestyle modifications significantly impacted prediabetes management. Physical activity increased from 2.5 to 6.0 hours/week ($p < 0.001$), and healthy diet adherence rose from 45% to 80% ($p < 0.001$). BMI decreased from 28.5 to 25.5 ($p = 0.003$) showing a clear positive effect of the intervention. (Table 4)

Biochemical markers

The table 4 showed that the average fasting blood sugar measured off was highest during the pretest (105 ± 10 mg/dL), then post-test 1 (95 ± 8 mg/dL), then post-test 2 (88 ± 7 mg/dL). Statistically significant ($p < 0.001$) differences in blood glucose levels between these time points were found.

Also, a reduction in HbA1c levels was recorded, with peak value during the pre-test (6.5 ± 0.5%), down to 6.0 ± 0.4% in post-test 1 and down to 5.7 ± 0.3% in post-test 2. HbA11c levels of the intergroup were different, and this difference was statistically significant ($p = 0.002$). They show a big decrease in both fasting blood glucose and HbA1c levels across the time points indicative of improved glycaemic control with decreasing values in the post test phases.

Table 1: Demographic variables of the prediabetic individuals N= 100

Demographic Variable	Option	Frequency	Percentage
1. Age	25-30 years	33	33%

	31-35 years	29	29%
	36-40 years	38	38%
2. Gender	Male	42	42%
	Female	50	50%
3. Occupation	Unemployed	12	12%
	Laborer/Farmer	25	25%
	Private sector job	46	46%
	Homemaker	17	17%
4. Income Level (Monthly)	Less than INR 10,000	33	33%
	INR 10,000 - 30,000	38	38%
	INR 30,001 - 50,000	17	17%
	More than INR 50,000	12	12%
5. Marital Status	Single	33	33%
	Married	50	50%
	Divorced	8	8%
	Widowed	8	8%
6. Family History of Diabetes	Yes	58	58%
	No	33	33%
	Unknown	4	4%
7. Residential Location	Rural	42	42%
	Semi-urban	33	33%
	Urban	17	17%
8. Smoking Status	Current smoker	25	25%
	Former smoker	17	17%
	Never smoked	50	50%

	Occasional smoker	8	8%
9. Alcohol Consumption	Regular (weekly)	17	17%
	Occasional (monthly)	25	25%
	Rare (few times a year)	33	33%
	Never	25	25%
10. Physical Activity Level	Sedentary	21	21%
	Light activity (1-2 times/week)	25	25%
	Moderate activity (3-4 times/week)	29	29%
	Active (5+ times/week)	25	25%

Table 2: Knowledge level of the prediabetic individuals on Prediabetes Management

Knowledge Category	Pre-Test (Mean ± SD)	Post-Test 1 (Mean ± SD)	Post-Test 2 (Mean ± SD)	Significance (p-value)
1. Knowledge about Prediabetes	50 ± 15	70 ± 10	85 ± 8	$p < 0.001$
2. Knowledge of Healthy Diet	55 ± 12	75 ± 10	90 ± 9	$p < 0.001$
3. Knowledge of Physical Activity	45 ± 15	65 ± 12	80 ± 10	$p < 0.001$
4. Knowledge of Medication Use	50 ± 10	70 ± 12	85 ± 9	$p < 0.001$
5. Knowledge about Blood Sugar Monitoring	40 ± 10	65 ± 10	80 ± 8	$p < 0.001$
6. Knowledge of Risk Factors	45 ± 12	70 ± 12	85 ± 10	$p < 0.001$
7. Knowledge of Preventive Measures	50 ± 13	72 ± 10	88 ± 9	$p < 0.001$
8. Knowledge of Complications	35 ± 10	60 ± 12	80 ± 10	$p < 0.001$

Table 3: Practice level of the prediabetic individuals on Prediabetes Management

Practice Category	**Pre-Test (Mean ± SD)**	**Post-Test 1 (Mean ± SD)**	**Post-Test 2 (Mean ± SD)**	**Significance (p-value)**
1. Adherence to Diet Plan	40 ± 10	65 ± 15	85 ± 10	$p < 0.001$
2. Regular Physical Activity	30 ± 12	55 ± 13	75 ± 12	$p < 0.001$
3. Monitoring Blood Sugar	35 ± 8	60 ± 10	80 ± 9	$p < 0.001$
4. Medication Adherence	50 ± 10	70 ± 12	85 ± 10	$p < 0.001$
5. Reduction in Smoking	20 ± 8	40 ± 10	60 ± 9	$p = 0.002$
6. Alcohol Reduction (units/week)	10 ± 3	6 ± 2	4 ± 1	$p = 0.005$
7. Attendance to Medical Appointments (%)	40 ± 12	65 ± 12	85 ± 8	$p < 0.001$
8. Stress Management (%)	35 ± 10	55 ± 10	75 ± 9	$p < 0.001$

Table 3: Lifestyle Modification Impact on Prediabetes

Lifestyle Modification Category	**Pre-Test (Mean ± SD)**	**Post-Test 1 (Mean ± SD)**	**Post-Test 2 (Mean ± SD)**	**Significance (p-value)**
Physical Activity (hours/week)	2.5 ± 1.2	4.8 ± 1.5	6.0 ± 1.7	$p < 0.001$
Healthy Diet Adherence (%)	45 ± 10	65 ± 12	80 ± 10	$p < 0.001$
Body Mass Index (BMI)	28.5 ± 3.2	26.8 ± 2.9	25.5 ± 2.6	$p = 0.003$
Blood Glucose (mg/dL)	105 ± 10	95 ± 8	88 ± 7	$p < 0.001$
HbA1c Level (%)	6.5 ± 0.5	6.0 ± 0.4	5.7 ± 0.3	$p = 0.002$

Table 4 Biochemical markers of the prediabetic individuals

Parameter	**Pre-Test (Mean ± SD)**	**Post-Test 1 (Mean ± SD)**	**Post-Test 2 (Mean ± SD)**	**Significance (p-value)**

Fasting Blood Glucose (mg/dL)	105 ± 10	95 ± 8	88 ± 7	$p < 0.001$
HbA1c Level (%)	6.5 ± 0.5	6.0 ± 0.4	5.7 ± 0.3	$p = 0.002$

DISCUSSION

The study results show significant improvements in participants' knowledge, practice, and lifestyle modifications for managing prediabetes. Knowledge about prediabetes, diet, physical activity, and risk factors improved significantly **(**$p < 0.001$**)**, reflecting the intervention's effectiveness in raising awareness. This result supported with previous studies done by Tajdar, D et al. that have emphasized the role of education in enhancing health literacy and promoting self-management behaviors among individuals at risk for diabetes. [11]

Practice levels, including diet adherence, physical activity, and medication use, also increased significantly ($p < 0.001$), with reductions in smoking **(**$p = 0.002$**)** and alcohol consumption **(**$p = 0.005$**)**. The result supported by the previous studies work that has revealed how systematically planned approaches can result in positive behavioural changes for high-risk groups. [12] Among these, the capability of smoking and alcohol decrease is considered significant because these factors worsening effects of diabetes and associated complications. [13,14]

Lifestyle modifications, such as increased physical activity, improved diet adherence, and reductions in BMI, fasting blood glucose, and HbA1c levels, were statistically significant **(**$p < 0.001$**)**. Overall, the intervention effectively promoted knowledge, healthier behaviors, and better prediabetes management. Literature supports that lifestyle interventions can result in substantial improvements in metabolic health, such as lower blood pressure and blood sugar, among everyone at risk of diabetes including those who are overweight. [15,16] In particular, it has been demonstrated that the HbA1c decrease is a predictor of decreased diabetes risk even in high-risk populations, reinforcing the value of early intervention in these at-risk populations. [17,18]

This intervention was so successful that other rural communities feeling a growing diabetes epidemic could also implement similar programs. Moreover, features of the family participatory approach could be integrated into diabetes prevention program and may help program's sustainability and effectiveness, because families are essential accomplices in realizing persons' health ways. [19,20]

CONCLUSION

This study shows that the family participatory intervention strategies used during this study have been successful in improving knowledge, practices and lifestyle changes in prediabetic individuals. The interventions' success is demonstrated by the significant increases in participant understanding of prediabetes, along with notable improvements in dietary adherence, physical activity levels and reduction in harmful behaviors such as smoking and

alcohol consumption. Additionally, the positive health metric changes in BMI, blood glucose and HbA1c levels demonstrate the ability of such interventions to prevent the development to type 2 diabetes. Future research should focus on the long-term effects of family participatory interventions and explore strategies for scaling these programs to reach broader populations at risk for diabetes.

CONFLICT OF INTEREST:
No

SOURCE OF FUNDING:
No

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