Review Article

Prediabetes Education: the Underutilized Tool of Diabetes Prevention among Indian Population

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ABSTRACT

Aim: This review aims to discuss the major effective educational interventions carried out among prediabetes population in different countries during the year 2001 to 2020. **Materials and Methods:** A PubMed, Science direct and Google Scholar detailed search was done on prediabetes education interventions and the search was limited to full text English articles with exclusions on articles with insufficient details. Youth diabetes prevention clinic for prediabetes, prediabetes booklet, web based meme generator, environmental posters, self assessment questionnaire, development of mobile health application, Smart watch activity trackers and home based counseling was found to be newer effective successful strategies ongoing in developed countries. **Results:** Detailed search and analysis could reveal that prediabetes educational interventions brought positive outcomes on improvements in fasting blood sugar, random blood sugar, fasting lipid profile and anthropometric parameters along with better life style changes. **Conclusion:** Education accompanied with self management training plays a crucial role in the management of early stages of diabetes. This review made an effort to highlight the effectiveness of each type interventions in prediabetes management in areas like nutrition, physical activity, weight management and stress relaxation which can be merged effectively in a better modified version and can be utilized in the future prevention trials in india.

Keywords: Educational Intervention, India, Lifestyle modification, Prediabetes Empowerment, Prediabetes Counseling, Health promotion.

Submission Date: 15-05-2021;
Revision Date: 26-04-2022;
Accepted Date: 10-08-2022.

DOI: 10.5530/ijper.56.4s.208

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INTRODUCTION

According to the IDF Diabetes atlas 2019, India holds 77 million diabetes, 43.9 million undiagnosed diabetes and 25.2 million impaired glucose tolerance cases. If current trends do not change, India will have 134 million adults with diabetes and 40.7 million adults with impaired glucose tolerance by 2045.[1] Diabetes being a chronic costly metabolic disorder having direct, indirect and intangible costs exhausts approximately 25% of average Indian house hold earning.[2] The 2019 estimated global direct health expenditure on diabetes is USD 760 billion and 8 billion USD among the South East Asian countries including India.[3] Previous studies conducted shown that diabetes negatively effects work efficiency and economic productivity. The absolute probability of working was 4.4 percentage points reduced for women and 7.1 percentage points reduced for men relative to normoglycemic population.[4] The psychiatric comorbidities associated with diabetes which includes diabetes distress, anxiety, eating disorders, depression, dementia and perpetual fear of hypoglycemia also adversely effect the quality of life.[5] Lack of awareness and understanding about the complications and multi organ involvement in diabetes makes management difficult in

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delayed recognition of the disease.[6] The practice of regular diabetes screening as well as knowledge attitude practice among prediabetes was found to be low in the questionnaire survey conducted among prediabetes population of south India.[7] Literature survey shown that nearly 50% of the population with prediabetes will convert to type 2 diabetes mellitus within the time period of 3 to 5 years.[8] Education accompanied with self management training plays a crucial role in the management of this silent killer disease.[9] Developing diabetes risk awareness and proper counseling in prediabetes population can prevent this disease to a greater extend.[10] This narrative review compiles the major educational interventions carried out among the prediabetes of different states and countries during 2001 to 2020. The objective of this work is to provide an updated review on the need for early diagnosis and management of prediabetes and the vital role of prediabetes education in prevention of this metabolic disorder in a developing country like India.

MATERIALS AND METHODS

Selection of Articles

A PubMed, Science direct and Google Scholar detailed search was done using the keywords Prediabetes, Educational intervention, Diabetes Prevention, Prediabetes Education, Prediabetes Empowerment, Diabetes Awareness, Randomized controlled trial. The search was limited to full text English articles on prediabetes education. Reference lists of original studies and narrative reviews were also searched manually. Prediabetes adult aged 18 and older as well as clinical trials with sample size <75 participants were included in this review. All the publications on educational interventions on prediabetes carried out during the last 20 years 2001 to 2020 was considered for literature review and relevant research articles among them was included in the preparation of this review (Figure 1). This review aims to highlight the newer technology based feasible educational interventions with proven adherence and cost effectiveness which can be experimented in a modified merged better version in the indian community setting.

Home-based Physical Activity Counseling

A 12 month home based physical activity counseling program called the Enhanced Fitness Intervention was designed to raise self efficacy for physical activity by incooperating self monitoring, goal setting, reinforcement, modeling and cognitive reframing among the prediabetes population of North Carolina, United

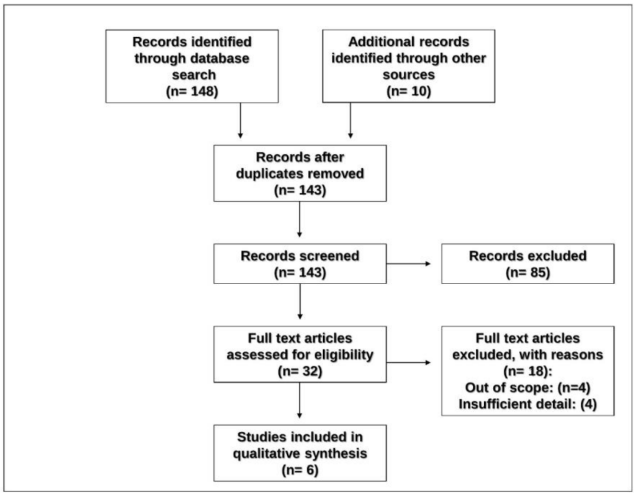


Figure 1: Flowchart for selection of articles.

States. This included sessions like baseline individual counseling, regular telephone counseling, monthly automated encouragement and physician support in clinic along with tailored mails. 302 overweight older (60-89 years) prediabetes population was randomly assigned to PAC intervention group (n=180) and usual care control group (n=122). Participants were assigned the long term goal of involving in 30 min or more of lower extremity aerobic exercise like walking for 5 or more days in a week along with 15 min of exercises to improve lower extremity strength on 3 non consecutive days each week. The trained health counselor based on the recommendations of U.S. Physical Activity Guidelines and protocol assessed current activity status and provided a two week physical activity prescription. Study subjects were provided with a notebook containing handouts on the health benefits of physical activity, tips for exercising safely, poster on specified exercises, different resistances elastic bands and a pedometer. The primary outcome was HOMA –IR at baseline, 3 and 12 months. The secondary indicators were HbA1c, anthropometric measures, health related quality of life physical function and self reported physical activity. Physical activity were assessed using modified version of Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire. Health related quality of life was evaluated using Short -Form -36 Medical Outcomes Study (SF-36) Questionnaire. Home based telephone counseling increased physical activity levels but it was not sufficient to make glycemic changes in older prediabetic outpatients.[11]

Community based healthy life style intervention program (Co-HELP)

A quasi experimental study on prediabetes was conducted in Seremban, Malaysia for a period of 12

months divided into two parts: first 6 months called active period and next 6 months called maintainence period. 268 prediabetes subjects aged between 18 to 65 years old were assigned to either the community-based lifestyle intervention (Co-HELP) (n = 122) or the usual care (n = 146) groups. A 12 group based sessions having 90 min each and 2 individual counseling sessions with dietician and researcher to counsel about behavioural change. Group sessions included activities like lecture, seminar, group work and discussions along with handouts, pamphlets and booklets. Group sessions were coordinated by community volunteers after getting training for two days before the intervention. Home visits were done to those who missed their follow ups or could not reach through telephone calls. The dietary advice were given by dietician based on Malaysian Nutritional Guidelines. Daily recommended energy requirement was estimated by the dietician based on three day food intake and as per diet plan was made for weight loss of 5-10% over a period of 6 months. Physical activity of minimum 150 min per week were encouraged and a 6km walking track was also set up. This pathway was away from main road for safety and at every km a banner with motivational quotes was put up. Pedometers were used to assess their progress. A specially designed diary were given to self monitor study subjects body weight, diet, biochemical tests and physical activity. To evaluate the progress pre and post test were performed after each educational session. A significant reduction in FBS, RBS, HbA1c, Waist circumference, diastolic blood pressure and an increase in HDL cholesterol was achieved during first 6 months and were maintained at the 12th month.[12]

Empowerment Program for Prediabetes

The world Health Organization have recognized empowerment as an effective patient education method as it gives patients a sense of control over their own lives and health which decreases the feeling of dependency. Empowerment interventions are carried out usually in three stages: Awareness, Action and Reflection. A randomized controlled trial was conducted between May and December 2013 in a health examination centre of a hospital in Kaohsiung, Taiwan. Participants were randomly assigned to either the control group or the experimental group having 4 month ABC empowerment program among prediabetes population. This program encouraged participants to practice a healthy life style through Awareness raising, Behaviour building and results Checking. This included eight 2 hr sessions that were provided bi weekly during the study period. Educator team included diabetes educator, diabetologist, dietician, occupational therapist and psychologist where they had to complete 9 hr empowerment education course under Taiwanese Association of Diabetes Educators. Health promoting life style was assessed using the Chinese version of the 24 item health –promoting life style questionnaire. Self efficacy was assessed using the Chinese version of the 25 item Self efficacy of Health Behaviour Scale. The results shown that empowerment program effectively encouraged prediabetes to adopt a healthy life style and improved glycemic level, BMI and Self efficacy.[13]

Youth Diabetes Prevention Clinic (YDPC)

YDPC at Indiana University School of Medicine, USA developed age appropriate tailored health education tools for diabetes prevention in at-risk youth and their families which also included comprehensive medical tests, dietary counseling and health education. The health education tool was developed through five stages of exploration, design, analysis, refinement and process evaluation. Based on review of literatures, clinic walk through and staff key informant interviews they developed four distinct health education tools which included a 16 pages booklet titled "Why are you testing me for diabetes : A booklet about blood sugar, your pancreas and unicorns'. Pancreas was represented in this book as popular cartoons. Secondly a web based meme generator was developed to document their progress and behaviour change. A pancreas mood can be choosed and can add a caption. The other tools were 4 visual environmental posters to reinforce the message that patients received. It visually explained risk levels and lab testing results. And the final tool was self assessment which included 9 questions with scorings on nutrition and activity behaviours. This study suggested that tailored health education tools are more effective than general prediabetes education pamphlets. This was a clinic based study and they recommends to test same in the community based settings.[14]

Mobile phone based program and smart watch activity tracker (JOOL Health)

A 12 week pilot randomized controlled trial was registered by University of Michigan, USA to estimate the ability of JOOL Health mobile application used alone and in conjuction with Fitbit smart watch activity tracker among adults with prediabetes. JOOL Health consolidate patient entered information like sleep, activity, eating with contextual data like local weather and after merging, delivers tailored messages to raise awareness and control the factors required for well

being and self care. A study team member would be available through phone to help participants solve technical issues with JOOL Health and to answer query related to study. Study subjects informed to monitor food, physical activity, body weight and blood tests on daily basis. Instructions were delivered through email on how to enter the data. The rate of adherence to JOOL Health and Fitbit smart watch tracker were calculated using number of app usage days to number of days in the study period. The acceptability of the intervention checked through semi structured interviews through phone which were audio recorded and imported to qualitative analysis software and coded. Results shows that among individuals with prediabetes who did not engage in free DPPs, this mHealth intervention was feasible and acceptable.[15]

Social Cognitive Theory based Intervention

A cluster randomized controlled trial on physical activity intervention was conducted on Iran prediabetic population for a period of 16 weeks. The intervention included educational program including behavioural change techniques like awareness on prediabetes and its consequences, setting specific goals for physical activity along with glycemic control. Goals of physical activity included frequency, duration and intensity. The physical activity was measured using International Physical Activity Questionnaire (IPAQ) long form which included 27 items of four category like vigorous activity, moderate activity, walking as well as sitting time. This questionnaire covered 4 domains of physical activity: activity at work, transportation, household/ gardening and leisure time activities. These data were converted to scores. In the education program, participants received one session per week that covered about 90 min (16 sessions). Study groups were instructed to do atleast 150 min of moderate intensity workout per week either early morning or afternoon. They were also encouraged to support one another to perform hill climbs that were available in east Azerbaijan, Iran and due to the lack of walkable environmental features like parks, green ways, gyms and other fitness facilities to workout. Results of this study shown that implementation of social cognitive theory based physical activity intervention on at risk population like prediabetes has potential benefit on fasting blood sugar, blood pressure and BMI.[16]

Mobile App Based Low Carbohydrate Dietary Guidance (CAReNA)

A single blind randomized controlled pilot study was carried out in Tianjin, China for a period of 3 months to investigate the impact of a new type of dietary guidance on anthropometric measurements, body composition and biochemical parameters. A low carbohydrate dietary guidance through a mobile app (CAReNA) was tested among the prediabetic population. A flash glucose monitoring sensor was inserted under skin on arm for measuring interstitial glucose every 15 min for upto 2 weeks and was recorded every 8 hr. CAReNA app was well explained to participants about the input items like meal, sleep as well as activity patterns. Applied Behavioural Analysis for Health Promotion Questionnaire having 70 questions was constructed to analyze exercise, diet, mental health, sleep and health consciousness. It contained 8 areas of life behaviour like dietary composition, eating behaviour, consumption of sweets and alcoholic drinks, physical activity, activity volition, stress, sleep quality and knowledge of healthy behaviour. Based on the 14 day diet photos entered by study subjects, dietician checked the nutritional content and as per grades like A,B,C,D were assigned. [A=very good (20-40 g carbohydrates), B= good (41-60 g carbohydrates, C= bad (61-80 g carbohydrates and D= very bad (81 g or above carbohydrates). Individual consultation of dietician with tailor made recommendations were provided. A significant improvement in postprandial hyperglycemia, BMI, body fat mass, percentage of body fat, visceral fat area, triglyceride levels, dietary habits and physical activity was obtained.[17] Table 1 represents all the selected prediabetes educational intervention trials included in the review and their outcomes.

RESULTS

The Enhanced Fitness Intervention 2012, physical activity home based counseling among USA population using combined mailing and telephone counseling made program accessible to prediabetes living in far places from clinic, their FBS, BMI and LDL were slightly declined and HDL were improved throughout the year. Eventhough this intervention couldn't make significant change in insulin resistance among the elderly but largely reduced their baseline sedentary behaviour. Previous literatures reported that elderly adults spend approximately 80% of their awake time in sedentary activities which represents 8 to 12 hr per day and changing this life style needs a real struggle.[18] The Co-HELP Program 2016, the Malaysian prediabetes population well adhered to the program guidelines particularly in achieving 5% or more weightloss, being physicaly active and improved health related quality of life both physical and mental components in 12 months.

Table 1: Prediabetes Educational Intervention trials and their results.

Educational Intervention	Research Design	Study Duration	Study Setting	Sample size	Results
Enhanced Fitness trial	Randomized Controlled Trial	12 Months (September 2008-March 2010)	North Carolina, USA	302 (292 Males 10 females)	Increased Physical activity levels along with slight decline in fasting blood glucose and improvement in HDL Cholesterol levels.
Co-HELP Program	Quasi Experimental study	12 Months (January 2012-June 2013)	Seremban, Malaysia	268 (96 Males 172 females)	Reduction in FBS, RBS, HbA1c, Waist circumference, Diastolic BP and increase in HDL
Empowerment Program	Randomized Controlled Trial	4 Months (May 2013-December 2013)	Kaohsiung, Taiwan	78 (29 Males 49 females)	Improved glycemic level, BMI and Self efficacy
JOOL Health Program	Randomized Controlled Trial	12 week (May 2017-March 2018)	Michigan, USA	105	Promote positive health behaviours among prediabetes.
SCT based Intervention	Randomized Controlled Trial	16 weeks (September 2017-January 2018)	Azerbaijan, Iran	272 (110 Males 162 Females)	Reduction in FBS, BMI and Blood pressure
CAReNA Mobile App Study	Randomized Controlled Trial	3 Months (May 2019-September 2019)	Tianjin, China	100 (39 Males 61 Females)	Improvement in Postprandial Hyperglycemia, BMI and Body fat mass

Health related quality of life is an important measure for assessing any therapy on non curable chronic disease.[19] Reduction in FBS, RBS, HbA1c, waist circumference, diastolic blood pressure and increase in HDL were attained in the first six months and maintained at the 12th month. The empowerment program 2017, shown short term positive effects on behavioural, physical and psychosocial outcomes in Taiwan prediabetes population. The intervention group improved significantly in terms of healthy lifestyle, blood sugar, BMI and self-efficacy at 3 months after completing the intervention. Constructing an equal partnership is a crucial initial step in developing the trust needed for prediabetes population inorder to share their opinions and experiences freely with their health care teams.[20]

Youth Diabetes Prevention Clinic 2019, a speciality clinic treating youth with prediabetes successfully developed age appropriate health education tools like meme generator. Since more than 90% youth are engaged in some form of social media. Tailoring is a proven approach to enhance message relevance and stimulate greater cognitive activity.[21] JOOL Health App USA 2019, possess key features like user friendly design, real time feedback and tailored individualized messages to promote healthy behaviours among prediabetes. Moreover, usage of Fitbit devices can enhance motivation, self efficacy and self monitoring techniques.[22] Mobile smartphone apps and other mHealth technologies are increasingly used as tools to promote lifestyle changes in USA. Social cognitive theory based intervention was particularly useful in rural communities since they are more prone to diabetes due to features like low income, long distances to hospitals and limited availability of sports facilities and fitness activities. Social cognitive theory based intervention is one of the most effective theories for prediction of physical activity behaviours due to the interactions between individual, environment and behaviour.[23] The mobile app based low carbohydrate dietary guidance effectively reduced the postprandial hyperglycemia in adults with prediabetes. Smartphone apps are useful and low-cost intervention for improving diet and nutrition and addressing obesity in the high risk population.[24]

CONCLUSION

In conclusion, life style modification through educational intervention is the most cost effective strategy to prevent type 2 diabetes among high risk population. Youth diabetes prevention clinic for prediabetes, prediabetes booklet, web based meme generator, environmental posters, self assessment questionnaire, development of mobile health application, Smart watch activity trackers and home based counseling was found to be newer effective successful strategies ongoing in developed countries. Trained professionals like diabetes educators, nutritionists, fitness trainers and psychologists can play a vital role in counseling sessions like lecture, seminar, group works and discussions with targeted population. Prediabetes can be provided with handouts, posters, pamphlets with pictograms, pedometers, resistance bands , specially designed diary, portion control plate,

glucometers to make counseling more effective and interesting. Tools like life style questionnaire, health behaviour scale, physical activity questionnaire, health related quality of life tools can also be incooperated to assess the level of adherence to therapy and counseling. Even though India is among the top 3 countries with diabetes and prediabetes, educational interventional studies and application of tools and technologies are less compared to countries like USA. This review make an effort to highlight the need for prediabetes detection, education and management for the effective prevention of diabetes in india.

ACKNOWLEDGEMENT

We express our gratitude to JSS College of Pharmacy, Ooty and JSS Academy of Higher Education and Research, Mysuru for providing various facilities used during the project. Authors wish to thank the staff and healthcare professionals of Govt. Medical College and Hospital, Ooty for supporting the project. We sincerely thank Department of Science and Technology, Govt. of India, New Delhi

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest for this study

ABBREVIATIONS

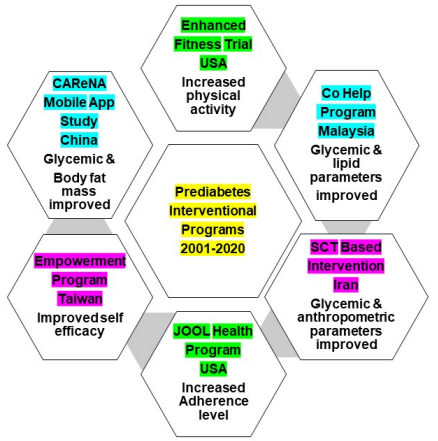
DPP: Diabetes Prevention Program; **FBS:** Fasting Blood Sugar; **HOMA –IR:** Homeostatic Model Assessment of Insulin Resistance; **HDL:** High Density Lipoprotein; **IDF:** International Diabetes Federation; **RBS:** Random Blood Sugar; **SCT:** Social Cognitive Theory.

REFERENCES

1. International Diabetes Federation. Brussels, Belgium: International Diabetes Federation; 2019. IDF diabetes Atlas. 9th ed. Available from: https://www.diabetesatlas.org [cited 12/8/2022].
2. Oberoi S, Kansra P. Economic menace of diabetes in India: A systematic review. Int J Diabetes Dev Ctries. 2020;40(4):464-75. doi: 10.1007/s13410-020-00838-z. PMID 32837090.
3. Williams R, Karuranga S, Malanda B, Saeedi P, Basit A, Besancon S, et al. Global and regional estimates and projections of diabetes related health expenditure; Results from the International Diabetes Federation Diabetes Atlas. 9th ed, Diabetes Res Clin Pract 2020; April;162:108072.
4. Tunceli K, Bradley CJ, Nerenz D, Williams LK, Pladevall M, Elston Lafata J. The impact of diabetes on employment and work productivity. Diabetes Care. 2005;28(11):2662-7. doi: 10.2337/diacare.28.11.2662, PMID 16249536.
5. Onyenekwe BM, Young EE, Nwatu CB, Okafor CI, Ugwueze CV. Diabetes distress and associated factors in patients with diabetes mellitus in South East Nigeria. Dubai Diabetes Endocrinol J. 2020;26(1):31-7. doi: 10.1159/000508706.
6. Venkataraman K, Kannan AT, Mohan V. Challenges in diabetes management with particular reference to India. Int J Diabetes Dev Ctries. 2009;29(3):103-09. doi: 10.4103/0973-3930.54286, PMID 20165646.
7. Mohsina Hyder K, Raja D, Jithin Mohan, Ponnusankar S. Assessing the Knowledge, Attitude and Practice (KAP) among the newly diagnosed Prediabetes screened in selected districts of South India. IJRPS;11(3):4836-46. doi: 10.26452/ijrps.v11i3.2780.
8. Muthunarayanan L, Ramraj B, Russel J. Prevalence of prediabetes and its associated risk factors among rural adults in Tamil Nadu. Arch Med Health Sci. 2015;3(2):178-84. doi: 10.4103/2321-4848.171899.
9. Mensing C. Comparing the processes: Accreditation and recognition. Diabetes Educ. 2010;36(2):219-43. doi: 10.1177/0145721710361390, PMID 20410368.
10. Okosun IS, Lyn R. Prediabetes awareness, health care provider's advice, and life style changes in American adults. International Journal of Diabetes Mellitus. 2015;3(1):11-8. doi: 10.1016/j.ijdm.2010.12.001.
11. Morey MC, Pieper CF, Edelman DE, Yancy WS Jr, Green JB, Lum H, et al. Enhanced fitness: A randomized controlled trial of the effects of home-based physical activity counseling on glycemic control in older adults with prediabetes mellitus. J Am Geriatr Soc. 2012;60(9):1655-62. doi: 10.1111/j.1532-5415.2012.04119.x, PMID 22985140.
12. Ibrahim N, Ming Moy F, Awalludin IA, Mohd Ali Z, Ismail IS. Effects of a Community-Based Healthy Lifestyle Intervention Program (Co-HELP) among adults with prediabetes in a developing country: A Quasi-Experimental study. PLOS ONE. 2016;11(12):e0167123. doi: 10.1371/journal.pone.0167123, PMID 27935988.
13. Chen MF, Hung SL, Chen SL. Empowerment program for people with prediabetes: A randomized controlled trial. J Nurs Res. 2017;25(2):99-111. doi: 10.1097/JNR.0000000000000193, PMID 28277390.
14. Yazel-Smith LG, Pike J, Lynch D, Moore C, Haberlin K, Taylor J, *et al.* Blood Sugar, Your Pancreas, and Unicorns: The development of health education materials for youth with prediabetes. Health Promot Pract. 2019;20(4):565-72. doi: 10.1177/1524839918778555, PMID 29788764.
15. Griauzde D, Kullgren JT, Liestenfeltz B, Ansari T, Johnson EH, Fedewa A, *et al.* A mobile phone-based program to promote healthy behaviors among adults with prediabetes who declined participation in free diabetes prevention programs: Mixed-methods pilot randomized controlled trial. JMIR MHealth UHealth. 2019;7(1):e11267. doi: 10.2196/11267, PMID 30626566.
16. Shamizadeh T, Jahangiry L, Sarbakhsh P, Ponnet K. Social cognitive theory-based intervention to promote physical activity among prediabetic rural people: A cluster randomized controlled trial. Trials. 2019;20(1):98. doi: 10.1186/s13063-019-3220-z, PMID 30717779.
17. Chen X, Su H, Kunii D, Kudou K, Zhang Y, Zhao Y, *et al.* The effects of mobile-app-based low-carbohydrate dietary guidance on postprandial hyperglycemia in adults with prediabetes. Diabetes Ther. 2020;11(10):2341-55. doi: 10.1007/s13300-020-00906-x, PMID 32870466.
18. Matthews CE, Chen KY, Freedson PS, Buchowski MS, Beech BM, Pate RR, *et al.* Amount of time spent in sedentary behaviors in the United States, 2003-2004. Am J Epidemiol. 2008;167(7):875-81. doi: 10.1093/aje/kwm390, PMID 18303006.
19. Gebremedhin T, Workicho A, Angaw DA. Health-related quality of life and its associated factors among adult patients with type II diabetes attending Mizan Tepi University Teaching Hospital, Southwest Ethiopia. BMJ Open Diabetes Res Care. 2019;7(1):e000577. doi: 10.1136/bmjdrc-2018-000577, PMID 30899526.
20. Anderson RM, Funnell MM. Patient empowerment: Myths and misconceptions. Patient Educ Couns. patient ed. 2010;79(3):277-82. doi: 10.1016/j.pec.2009.07.025, PMID 19682830.
21. Kreuter MW, Wray RJ. Tailored and targeted health communication: Strategies for enhancing information relevance. Am J Health Behav. 2003;27(3);Suppl 3:S227-32. doi: 10.5993/ajhb.27.1.s3.6, PMID 14672383.
22. Asimakopoulos S, Asimakopoulos G, Spillers F. Motivation and user engagement in fitness tracking: Heuristics for mobile healthcare wearables. Informatics. 2017;4(1):5. doi: 10.3390/informatics4010005.
23. Taylor LM, Raine KD, Plotnikoff RC, Vallance JK, Sharma AM, Spence JC. Understanding physical activity in individuals with prediabetes: An application of social cognitive theory. Psychol Health Med. 2016;21(2):254-60. doi: 10.1080/13548506.2015.1058486, PMID 26300537.

24. Coughlin SS, Whitehead M, Sheats JQ, Mastromonico J, Hardy D, Smith SA. Smartphone Applications for Promoting Healthy Diet and Nutrition: A Literature Review. Jacobs J Food Nutr. 2015;2(3):021. PMID 26819969.
25. Martin LR, Williams SL, Haskard KB, Dimatteo MR. The challenge of patient adherence. Ther Clin Risk Manag. 2005;1(3):189-99. PMID 18360559.
26. Leung AWY, Chan RSM, Sea MMM, Woo J. An overview of factors associated with adherence to life style modification programs for weight management in adults. Int J Environ Res Public Health. 2017;14(8):922. doi: 10.3390/ijerph14080922, PMID 28813030.
27. Schmidt SK, Hemmestad L, MacDonald CS, Langberg H, Valentiner LS. Motivation and Barriers to maintaining life style changes in patients with type 2 diabetes after an intensive life style intervention (The U-TURN Trial): A longitudinal qualitative study. Int J Environ Res Public Health. 2020;17(20):7454. doi: 10.3390/ijerph17207454, PMID 33066239.

PICTORIAL ABSTRACT



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SUMMARY

This review tried to compile selected effective prediabetes educational interventions carried out during the last 20 years in different countries and made an effort to highlight the effectiveness of each type intervention in high risk prediabetes population which can be merged effectively in a better modified version in the future prevention trials in India. In the last 20 years, the estimates of diabetes prevalence in India shows a drastic rise from 32.7 million to 77 million diabetes cases. So the diabetes prevention strategies in India seems to be not real effective and new strategies have to be experimented in the early stages like prediabetes where there is 50 percent chance to revert to normoglycemia. For any trial or intervention to be successful in any disease the main factor to be considered is adherence. No single intervention strategy can improve the adherence in all the study subjects, years of research prove that successful effort to improve subject adherence depend upon a series of key factors like assessment of patients knowledge and understanding about the therapy, mutual convincing communication between health professionals and patients as well as building up of trust in the therapeutic relationship.[25] Evaluating adherence helps to indicate the level to which an intervention has achieved its specific goals and objectives.[26] It is crucial to fully understand the motivational factors and possible barriers to encounter in designing of any educational intervention especially in a life style disease like diabetes.[27]

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Cite this article: Hyder MK, Balasubramaniam V, Undela K, Ponnusankar S. Prediabetes Education: The Underutilized Tool of Diabetes Prevention among Indian Population. Indian J of Pharmaceutical Education and Research. 2022;56(4s):s613-s619.