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Research Article

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Food Pantry-Based Intervention May Help Improve Diabetes Self-Management in Low Socioeconomic Status Individual

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Abstract

With the increased use of food pantries to improve food accessibility, food pantries may play a large role to promote good Diabetes Mellitus (DM) self-management in low socioeconomic status (SES) individuals. A complete literature review was done to investigate and analyze published research utilizing food pantries as sites to implement interventions towards improving DM self-management. A thorough search within public information domain including Google scholar, PubMed, NCBI, using MeSH keywords: food insecurity, low SES, DM self-management and self-efficacy. An estimated 20 article resources were included to generate a concise and descriptive findings towards answering the research question. Only low socioeconomic status individuals with food insecurity and DM were included in this review. Results findings revealed only few published studies involving food-pantry-based interventions and DM self-management. Although the studies confirmed that food-insecurity strongly influenced inefficient DM management and glycemic control, they also produced mixed findings in promoting self-management of the disease. Some study findings confirmed significant improvement in DM self-management, while others did not find specific significance in promoting self-management. More research is needed to further evaluate the effectiveness of food-pantry based interventions in DM management.

Keywords: Food Insecurity, Low Food Supply, Food Scarcity, Low Socioeconomic Status, Diabetes Mellitus Self-Management, Diabetic Mellitus Self-Efficacy, Food Pantry, Food Bank.

Introduction

Diabetes mellitus (DM) is not only a medical issue; it is a major public health problem that is manageable (1). Yet, it has a high disease burden on individuals and the society, with its complications causing high rates of morbidity and mortality resulting in substantial health care costs (2). DM is the 7th leading cause of death in the US, with an immense disease prevalence of 1.5 million people being diagnosed annually and 84.1 million Americans noted to be prediabetic (3). Some of the numerous risk factors associated with DM include age, ethnicity, family history, smoking, obesity, physical inactivity, environmental effects, low socioecomic status (SES). Current guidelines for diabetes management include improving blood glucose control through patient engagement in diabetes self-management and lifestyle change, which will require formal diabetes education about diet, physical activity, blood glucose monitoring, pharmacotherapy-related intervention, and regular medical follow-up intervals with screening for complications (4). Unfortunately, meeting these guidelines is difficult especially in individuals with low SES as they have less access to available therapies including good quality of care, social support and community resources (5). Hence at-risk individuals are more likely to suffer from DM Type 2 and have poor glycemic control that may result in more severe complications. The current diabetes self-management guidelines can be challenging for low SES individuals. They can result in significant psychological stress that supplement at-risk individuals' other negative stressors, which may in turn negatively affect glycemic control (6). One major risk factor is food insecurity; it acts to immensely impede achieving good DM self-management in low SES population. With the occurrence of the COVID-19 pandemic, food-insecurity has worsened despite Congress implementing the Congress' Families First Coronavirus Act (FFCA) to expand federal nutrition assistance programs like

Supplemental Nutrition Assistance Program (SNAP) (7). This is especially true for low SES individual who already face debilitating food resource challenges. Populations with severe food insecurity have more DM prevalence compared to food secure groups, as food insecure populations are more likely to consume cheaper and less nutritious foods that have higher caloric density (8). As evidence by the higher national prevalence of food insecurity from 10.7% (2001) to 11.8% in 2017, food pantry use has grown increasingly common among food insecure households (9). Because food insecurity is a strong preponderance in diabetes, food pantries can play a larger role in addressing the prevalence and management of diabetes. This review aims to prove that services offered at food pantries may help improve self-efficacy to efficiently self-manage DM, and promote good glycemic control in low SES population.

Methods

This narrative review followed a stepwise process; it identified the hypothesis containing the research question, determined searching parameters for relevant studies, developed search methods (criteria) to find the relevant studies, summarized and reported the results of the studies. The review was qualitative in nature. Hypothesis/Research Question: Can food pantry services help improve self-efficacy to self-manage DM and promote good glycemic control in low SES population?

Search Parameters for Identifying the Relevant Studies

The researcher used Google scholar general search engine as a preliminary tool to identify relating studies within the set search parameters. The set search parameters included keywords within the Medical Subject Headings (MeSH) confinement. These keywords included: food insecurity (low food supply, food scarcity, food security), socioeconomic status (social class, social conditions, income), prediabetes (prediabetic state, hyperglycemia), diabetes mellitus. More specific search engines were used including National Center for Biotechnology Information (NCBI), PubMed, PLOS one.

Developing Search Methods/Inclusion and Exclusion Criteria:
Studies describing findings on food insecurity, undiagnosed and diagnosed Diabetes in connection with food pantry, food pantry based intervention and glycemic control, low socioeconomic status and diabetes, DM self-management and low socioecomic status were further scrutinized. Only studies detailing food-bank/pantry-based interventions to improve DM self-management were included extensively in this study. 25 articles satisfied the inclusion criteria, with publication years spanning from 1999 to 2020. Excluded studies were not specific to food insecure population with diabetes receiving food pantry based interventions to improve self-management of the disease.

Summarizing and Reporting

Data findings from the relevant studies were collected and stored on a secure and password protected hard drive. The findings that mainly consisted of theoretical discussions, qualitative and quantitative data were analyzed qualitatively and associated with the respective research question. The focused articles specifically relating to the research question were categorized by study year in Figure 1, depicting study design and methods, characteristics, target population and sample size, objectives and findings.

Article & Author	Study type	Study participants	Intervention	Results
A Pilot Food Bank Intervention Featuring Diabetes-Appropriate Food Improved Glycemic Control Among Clients In Three States Seligman et al, 2015	Prospective study	768 Food pantry participants with HbA1c>6.5% Food insecure; low SES; Diabetic	Provided diabetes appropriate food, blood glucose monitoring, primary care referral, self-management support. No control group	Improved self-efficacy and medication adherence Decreased total mean HbA1c from 8.11% to 7.96% (p<0.01) Decreased mean HbA1c from 9.52% to 9.04% in participants with >7.5% HbA1c
Food insecurity and diabetes self-management among food pantry clients Ippolito et al, 2016	Cross-Sectional descriptive study	1237 Food pantry participants; food insecure; low SES; Diabetic	No intervention implemented Comparative study between Food insecure vs food secure groups	0.51 units lower diabetes self-efficacy 0.79 units higher diabetes distress mean 0.31 units higher medication non-adherence scores 2.6 times greater odds of severe hypo glycemic event Higher odds of experiencing depression, meds and diabetes supplies scarcity.
Comprehensive and Medically Appropriate Food Support Is Associated with Improved HIV and Diabetes Health Palar et al, 2017	Prospective study	72 participants with HIV, DM or both. 32 of the participants had DM or both (DM and HIV). Food insecure; low SES	"Food = Medicine Program" 72 food insecure participants with HIV, DM or both. 32 participants had either DM or both (DM and HIV). Food resources were provided to meet the average energy requirements	Only 72.2% of the participants fully engaged Significant decrease in food insecurity severity Only 11.5% of participants still reported very low food security at follow up compared to the baseline 59.6% (p<0.0001) Decreased fatty foods consumption from 3.19 to 2.21 per day (p=0.003) Decreased sugary food intake from 0.994 to 0.650 times per day (p=0.003) Decreased depressive symptoms (from 7.58 to 5.84; p=0.028) Decreased hospitalization from 25% to 6.90% (p=0.09), Decreased ED visit from 31% to 13.8% (p=0/09) Increased DM self-management scores from 24.8 to 27.3 (p=0.007) Decreased DM distress scores from 2.64 to 2.02 (p<0.01) No significant decrease in mean HbA1c (9.23% to 8.75%, p=0.41)
Comprehensive Diabetes Self-Management Support From Food Banks: A Randomized Controlled Trial. Seligman et al, 2018	Randomized controlled trial	568 participants; control=220, intervention group=203 Food insecure; low SES; Diabetic	Provided diabetes education, health care referral, packaged diabetes-specific food, monitoring glucose level and HbA1c in 2 successive sessions at 3 months interval. 28% (162) participants lost during follow-up. Only 40 out of 203 (19%) participants fully complied and participated in the study	HbA1c in intervention group was statistically insignificant at 9.12% vs control group 8.88% (p=0.16), which decreased from baseline levels (9.75% vs 9.74% respectively) There was statistically significant improvements related to food security (p=0.03), food stability (p=0.01), and fruit/vegetable intake (p=0.04) Only 40 out of 203 (19%) participants fully complied and participated in the study with a resulting statistically significant decrease in HbA1c (8.6%) compared to the nonadherent participants (9.24%) (p=0.02)
Efficacy of Augmented Food Pantry Services in Addressing Food Insecurity. Ridberg et al, 2020	2 phase Cross-Over Randomized Controlled study	568 Participants with HbA1c >7.5% Mean age 55 Range (23-86) Food insecure; low SES; Diabetic	Feeding America Intervention Trial for health-DM (FAITH-DM) Food insecure participants received bimonthly food, diabetes education, health care referral and glucose monitoring.	Positive causal relationship between food pantry based interventions and improving food security. Utilized a 12 point Rasch scale, Intervention group was 0.627 points compared to control group (P=0.02, 95% CI: -1.16 – 0.099) in phase 1. Phase 2 showed 0.879 ponts with P=0.003 and 95% CI 9-1.46 and -0.303)

Figure 1. Modified Table depicting essential results of reviewed studies

Results

Over 3000 articles were generated and assessed for eligibility. After duplicate searches were removed, 374 articles were selected and scrutinized to meet the inclusion criteria used in this narrative review. A more focused search using more specific search engines including NCBI, PubMed, and PLOS one generated 10 studies meeting the specific search criteria.

Choosing the Included Studies

These 10 studies were further analyzed based on their abstracts and using the focused search criteria: DM management interventions in food pantry among low SES; food pantry based intervention in DM type 2 self-management. 5 literatures met the predefined inclusion criteria. They span the time frame from 2015 to 2020. This narrative review mainly focused on studies that introduce food pantry-based interventions towards improving diabetes mellitus self-efficacy and management. These studies examined a range of biometric outcomes extending from body mass index (BMI), weight, glycated hemoglobin (HbA1c), glycemic control, fruits/vegetable intake and depression. Only the results from studies depicting biometric outcomes measurements of glycemic control and HbA1c levels were discussed in-depth within this review.

Findings

Each study's participants consisted of food pantry attendees comprised of mostly women in comparison to the quantity of men, with mean ages from 45.9 to 56.6 years (10). As discovered by Seligman et al, adjusting for age, sex, race/ethnicity, education, language, and pantry site did not alter the biometric outcomes within their study (11). Hence, this narrative review only includes and discusses the analyzed findings pertaining to the food pantry interventions regardless of differences (biological or psychological) among the food-insecure pantry participants. Food pantry-based interventions primarily included adding healthier food distribution into food pantry services and providing education to food pantry clients onsite. The interventions may also include other less discussed aspects including medical referrals, education, gift incentives and others. As previously stated, this review includes studies measuring biometric outcomes primarily including glycemic control and HbA1c levels.

In the cross-sectional descriptive study consisting of 1237 food pantry participants, Ippolito et al confirmed poorer diabetes self-management in food insecure groups compared to food secure individuals. Food-insecure groups had 0.51 unit's lower diabetes self-efficacy, 0.79 unit's higher diabetes distress mean, 0.31 unit's higher medication non-adherence scores, and 2.6 times greater odds of severe hypoglycemic event in comparison with food-secure groups. The odds of experiencing medication scarcity, diabetes supplies deficit and depression were also higher among food insecure groups (12).

Seligman et al reported, in the 6-month pilot intervention study, that by providing diabetes-appropriate food, blood glucose monitoring, primary care referral, and self-management support to 768 food pantry participants with diabetes (HbA1c>6.5), there was improvement in glycemic control. In addition, fruit and vegetable intake increased from 2.8 to 3.1 servings per day in 60% of participants. Self-efficacy and medication adherence also improved with resulting decreased diabetes distress and significant HbA1c decrease from 8.11% to 7.96% ($p<0.01$). There was also a mean HbA1c decline from 9.52% to 9.04% ($P=0.001$) among pantry participants with higher than 7.5% HbA1c. Seligman et al acknowledged several study limitations including lack of control group, differences in study implementation within the chosen food pantry locations and the resulting amounts of clients lost to follow up, which further differentiated the study implementation in all food pantry locations (California, Ohio and Texas).

Palar et al's Food = Medicine study also based pantry intervention on providing appropriate foods assistance to 72 food-insecure participants with known chronic illness (HIV, DM, or both). In this study, the Project Open Hand (POH) organization assumed the role of food pantry/bank providing assistance to meet the average energy requirements as advised by POH nutritionists. Out of the 72 participants, only 52 (72.2%) completed the Food = Medicine intervention and follow-up study assessments, of which 32 out of 72 total participants had known DM diagnosis (13). All reported findings from the Palar et al study discussed within this review pertain only to participants with DM (32 participants). The study outcomes revealed a significant decrease in food insecurity severity within the 6 months' span for all of the participants, as only 11.5% of participants reported very low food security at follow-up compared to the original baseline 59.6% ($p<0.0001$). This finding is further corroborated in Ridberg et al's cross-over randomized controlled study (the FAITH-DM trial) involving 27 food pantries in multiple states (Detroit MI; Houston, Tx; and Oakland, CA) from 2015 to 2018. The FAITH-DM trial, involving 568 food pantry participants with HbA1c 7.5% or greater, showed a causal relationship of food bank-based interventions improving food security scores in intervention group compared to control group in both phases; Phase 1($P=0.02$ and 95% CI (-1.16, -0.099)), Phase 2 ($P=0.003$ and 95% CI (-1.46, -0.303) (14).

Palar et al's study also revealed that participants' diet changed to promote healthier choices, with decrease in fatty foods consumption from 3.19 times daily to 2.21per day ($p=0.003$), decreased frequency of sugary foods intake from 0.994 to 0.650 times per day ($p=0.06$), and increased fruits and vegetables intake from 1.85 to 2.34 times daily ($p=0.011$). BMI, a correlating/co-modifying factor with prevalent diseases like DM, cardiovascular disease and HTN, also decreased from 36.1 to 34.8 at follow-up ($p=0.035$). Participants also experienced fewer depressive symptoms on follow-up (7.58 to 5.84; $p=0.028$) and less alcohol binging (26% to 13.5%; $p=0.008$). Participants also spent less money on prescriptions medications from 28.9% to 15.4% ($p=0.046$) (13). Tendencies of hospitalization decreased from 25% to 6.90% ($p=0.09$), so did ED visit from 31% to 13.8% ($p=0/09$). The study reported increase in diabetes self-management scores from 24.8 to 27.3 ($p=0.007$) while diabetes distress scores decreased from 2.64 to 2.02 ($p<0.001$) (13). Despite multiple statistical significant findings including higher prevalence of less than 7% HbA1c ($p=0.08\%$), Palar et al reported lack of significant decrease in mean HbA1c (9.23% to 8.75%, $p=0.41$), likely secondary to decreased study power, low participant volume ($n=27$) and lacking a formal comparable control group.

Unlike in the 2015 Pilot intervention study, Seligman et al's sub-

sequent randomized controlled trial, in 2018, included a nonintervention/control group. Seligman et al reported no significant increase in diabetes self-efficacy, diabetes distress and medication non-adherence. In fact, HbA1c in intervention group was statistically insignificant at 9.12% vs control group 8.88% (p=0.16), which decreased from baseline levels (9.75% vs 9.74% respectively). The randomized control trial enlisted 568 participants with HbA1c = 7.5% or greater in a 6-month intervention study consisting of providing diabetes education, health care referral, packaged diabetes-specific food, and monitoring glucose level and HbA1c in 2 successive sessions at 3 months' interval. The final analysis consisted of 203 interventions versus 220 control participants, signifying a loss of 28% (162) participants during follow-up. There were statistically significant improvements related to food security (p=0.03), food stability (p=0.01), and fruit/vegetable intake (p=0.04). Among the intervention participants, only 40 out of 203 (19%) fully complied and participated in the study with a resulting statistically significant decrease in HbA1c (8.6%) compared to the non-adherent participants (9.24%) (p=0.02) (15).

Discussion

Given the already elevated and still increasing prevalence of DM globally, there is even more significance to generate novel techniques to manage the chronic illness outside the currently practiced guidelines. Because successful DM management depends on clinical and nonclinical interventions, afflicted individuals implement subpar interventions that fail to efficiently control their chronically elevated blood glucose levels. This is because a large aspect of the nonclinical intervention depends heavily on self-efficacy and self-management of the disease. DM self-management involve adopting demanding health behaviors like daily dietary decisions, physical activity, blood glucose monitoring, and consistent medication adherence required in achieving good glycemic control. Due to the multifaceted nature of successful DM management, most afflicted individuals lack the knowledge and the resources to control their illness. This is especially true in low SES individuals who may have twice more disease prevalence than wealthier populations, resulting in increased rate of hospitalization for acute diabetes-related complications (16). Poor glycemic control is especially high in individuals of low social economic status, as they are more susceptible to poor nutrition, food insecurity, medication non-adherence, poor healthcare disparity and increased mortality rate.

In low SES groups, food insecurity is a direct impediment to achieving good DM self-management (8). Because low SES individuals have limited access to healthy food, they instead depend on available access to foods with high salt content, inexpensive carbohydrates with high glycemic index and energy that increases the risk of developing or further worsening the DM condition (17). Solely identifying and informing patients of available community services and resources in order to break their dependence on unhealthy food sources and poor coping mechanisms is insufficient; these community assistance programs will likely be underused as they are often correlated with a sense of shame and loss of dignity. Actively enrolling at-risk population onsite increases the likelihood of community resource usage rate (18). Hence food pantries, which already play a large role to alleviate the burden of food insecurity in low SES individual, may also be implemented to improve self-efficacy in order to better self-manage DM, and promote good glycemic control in low SES population. Food pantries present the opportunity for disease screening of undiagnosed at-risk individual in a nonclinical setting where they are more receptive to interventions focused on lifestyle/behavioral modifications. This is even truer during the COVID-19 pandemic, resulting in necessary closures of services including primary care provider offices. Implementing such nonclinical intervention is fitting as food pantry clients have a higher prevalence of diet-sensitive chronic diseases, with over one-third of the households reporting a member with a known diagnosis of DM (19).

There have been relatively few published studies on DM type 2 self-management implemented in food pantries and food banks. This narrative review identified the only 3 studies that implemented DM-specific nonclinical management intervention in food pantry/bank setting towards improving glycemic control among low SES individuals. All of the studies' findings were based mainly on the biometric outcome HbA1c. In regards to food pantry participants with DM, all studies corroborated findings of significant decrease in food insecurity severity. Findings also showed participants adopting healthier behavioral lifestyles consisting of increased fruit and vegetable consumption, decreased intake of sugary and fatty foods, smoking less cigarette and experiencing less alcohol binge drinking episodes. With the assumption that food-pantry-based nutritional sources made up the majority of the proposed nutritional diet, study participants are able to decrease high energy dense calorie foods intake, which is a major risk factor for DM in low SES individuals.

By decreasing food insecurity severity via increasing access to diabetes-specific foods, participants likely became less dependent on high calorie diets and experienced less severe chronic hyperglycemic states. In addition, weight and BMI also decreased secondary to maintaining a diabetic diet. This correlated well with findings by Flynn et al's single-arm 6-week healthy cooking intervention study showing that food pantry clients achieved significant reduction in BMI and weight after using a plant-based diet recipe (20). Flynn et al's findings resolved the "Hunger-obesity paradox" where low income food insecure individuals experience increased risk of obesity due other risk factors associated with poverty (21). By supplementing food pantry-based interventions with referral to clinical DM-related services, study participants further learn about the benefits of increasing vegetable and fruit consumption and decreasing sugary foods. Although, Bomberg et al discovered that fruit and vegetable intake actually increased in frequency in participants who recently utilized DM-related health care service within the clinical setting ($p<0.01$); unfortunately, sugar-sweetened beverages and deserts increased in frequency within the same population subset (p=0.02) (22). Food pantry clients also experienced less financial strain associated with food scarcity. They spent more money towards promoting healthier behavior lifestyles including maintaining good eating habits, purchasing and adhering to their prescribed medications and avoiding stressors from unaffordable medical cost. In fact, studies showed that participants were likely to spend less money on diabetes related healthcare cost including medications as they experienced less diabetic distress episodes requiring ED visits and hospitalization.

As stated earlier, food pantry study participants also received non-food resources including onsite education, formal lecture lessons on self-managing DM, food recipes, and referrals to primary care physicians in addition to food resources. Increasing the study participants' knowledge wealth via education on DM self-management increased their self-efficacy needed for the disease management. This correlates with the high satisfaction level reported by most of the participants' in the randomized intervention trial. Also as explained by Silverman et al, poor diabetes management in relation to food insecurity is associated to depression, diabetes distress, low medication adherence and worsened glycemic control (23). Decreasing food insecurity severity probably resulted in decreased self-management-induced anxiety that may have caused further negative stressors; participants likely became more willing to adopt the demanding health behaviors needed to achieve good glycemic control. Hence by resolving the food insecurity dilemma with resulting subsequent decrease in HbA1c, participants were more likely to achieve better glycemic control and experience less depressive episodes as purposed by Palar et al.

All of the reviewed studies measuring HbA1c levels showed notable decrease in this specific biometric outcome, although only Seligman et al recorded significant decrease in HbA1c in 2015. The uniform decrease in measured HbA1c correlated well with other biometric outcome results measured in all of the discussed studies including increased DM self-efficacy and reduced DM distress mean. This signifies successful implementation and utilization of pantry-based intervention in some of the participants who achieved improved control of their DM illness. The significant measurements of other biometric outcomes including increased medication adherence, decreased depressive episodes, improved diet choices like decreased fatty foods and increased vegetables/fruit provide evidence that the pantry-based intervention promoted participants to adopt healthier behavioral lifestyles changes despite their individual negative social risk factors. The study participants also reported less ED visit and hospitalizations from hyperglycemic or hypoglycemic crisis. Hence, the lack of finding significantly decreased HbA1c levels by Palar et al, and Seligman et al (13,15) likely related to deficits within the study designs and implementation.

One clear deficit within the study design includes lack of comparison/control groups needed to measure true significance and effectiveness of the food-pantry-based interventions. Palar et al alternatively provided comparison, in regards to food insecurity, between low vs very low food-insecure pantry participants in the food = Medicine intervention study; there was no comparison between both groups to analyze HbA1c level changes. The food=-Medicine intervention study findings also lacked Power due to the small sample size (n=72), of which only 31 clients represented the DM intervention population.

Unlike in the 2015 pilot study, Seligman et al included a control vs intervention group dynamic in the randomized controlled trial, but discovered no significant difference in HbA1c level between both groups. In fact, the study suggested that participants in the control group had greater mean decrease in HbA1c levels by not receiving the pantry-based intervention. This trivial finding in both groups reflects the challenges of managing a complex and multifaceted disease as DM (24). The results may also relate to several limitations within the study design and implementation. The randomized trial gathered data from three different states (California, Michigan and Texas). Each pantry involved in the study offered individual site-specific intervention, thus lacking uniform intervention. In addition, the provided intervention did not aim to reduce access to carbohydrates or added sugars in the pre-packaged diabetes appropriate foods (15). Hence, the study's intervention protocol lacked standardization between all 3 study sites. The randomized control trial also suggested providing primary care physician referrals to participants in need of medical checkups as part of the intervention, but did not elaborate on whether participants complied with attending their appointments as directed. In addition, 28% of the study participants were lost to follow-up during implementation, resulting in 72% retention (203 interventions participant's vs 220 control group) (15). This signified less than 80% power of trial effectiveness. Interestingly, only 19% (n=40) of the intervention group met the full engagement criteria and had significant decrease in HbA1c levels compared to the other study participants (control and non-adherent intervention group) (15). This corroborates the assumption that a significant decrease in HbA1c was likely achievable by promoting greater participant engagement in the intervention. Hence, promoting more participation within the intervention group is required to achieve greater HbA1c decline and subsequent significant measurement.

With the occurrence of COVID-19 pandemic, maintaining healthier behavior lifestyles is even more challenging as more families become at risk of severe food insecurity, likely resulting in even higher prevalence of individuals with uncontrolled DM. Although available data on COVID-19 do not show increased susceptibility of diabetic individuals to the virus, people with uncontrolled DM are still assumed to be high risk for complications if infected (25).

Despite the lockdown on nonessential services, food pantries continue to function. Hence, they may provide a location to acquire nutritious diabetes-specific foods and nonclinical services to perpetuate self-efficacy and DM self-management towards achieving and maintaining good glycemic control. Food pantries may also serve as clinical services extension sites where medical providers can refer at-risk patients to continue DM-related individualized care.

Conclusion

Resolving food insecurity severity in low SES individuals with DM (especially type 2) is efficacious in improving DM self-management. Food pantries present a distinct novel opportunity to help resolve this risk factor in low SES individuals. Food pantries also provide the opportunity to act as nonclinical locations to implement interventions towards improving DM self-efficacy and disease self-management in order to achieve better long-term glycemic control. Although there are very few available studies depicting food pantry-based interventions towards improving DM self-management, these studies show significant promise in lowering blood glucose and HbA1c. Unfortunately, the available studies are limited by several factors extending from lacking proper comparable controls, using uniform food-pantry intervention protocol, and participants lost to follow up during intervention implementation. More randomized trial studies are needed to fully

evaluate the effectiveness of food pantry-based intervention for DM self-management, while considering the aforementioned dilemmas. Resolutions for these limitations may include restricting the study's intervention site to one location, providing intermittent gifts to commemorate meeting HbA1c goals, including over the phone check-ups during intervention in order to increase contact frequency with intervention educators and decrease the interval duration between the scheduled 3 months follow up. This will ensure a more robust participants' engagement, resolve low participant's retention rate and losses to follow up dilemma.

Tables and Figures

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