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Improving Knowledge of Parents in Dietary Management for Children with Diabetes and Hyperlipidemia: A Quality Improvement Project

Jorge L. Valdes
jvald205@fiu.edu

Charles Buschemi
cbuscemi@fiu.edu

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By

JORGE L. VALDES MSN, APRN, FNP-BC

Supervised By

CHARLES BUSCEMI PhD, APRN

Approval Acknowledged:

DocuSigned by:
27267E9FF76F460...
_____, DNP Program Director

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Abstract: There is evidence that the number of cases of hyperlipidemia and diabetes in children is increasing along with the prevalence of childhood obesity in low- and high-income countries. Several factors may influence the dietary management of chronic conditions in children and adolescents, including the perceptions and beliefs of parents and caregivers about the conditions and their role in treating them. Shifting the focus of obesity, hyperlipidemia, and diabetes prevention interventions to the early education of parents has the potential to change children's dietary habits significantly and decrease their risk of suffering from these chronic conditions. Ab important goal of this Quality Improvement project was to initiate an educational program that addresses community dietary management and the prevention of chronic conditions such as hyperlipidemia and diabetes. **METHODS:** The parents of pediatric patients diagnosed with hyperlipidemia and diabetes were administered as a pre- and post-test the Revised General Nutrition Knowledge Questionnaire (GNKQ), which consists of four domains of nutrition knowledge: dietary recommendations (DR), sources of nutrients in food (SON), knowledge of healthy food choices (HFC), and diet, disease, and weight management (DDWM). The scores were tabulated for each section to obtain a total score (T0 and T1). **RESULTS:** The total and individual section scores for the pre-test (T0 = 60%) and post-test (T1= 69.55%) for the GNKQ. The mean overall GNKQ score including the pre- and post-test values for the parent participants was 57.00 (± 8.85), representing 64.77%. **CONCLUSION:** The results indicated improvement in the participating parents' overall nutritional knowledge after the implementation of nutritional education in this Quality Improvement project. These sections measured knowledge of the groups of food selection and the suggested serving sizes, sources of nutrients in food, and the correlation between diet and disease.

Keywords: education, nutrition, knowledge

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Introduction

Identification of the Problem

There is substantial evidence that, in low- and high-income countries, the number of cases of hyperlipidemia and diabetes in children is increasing along with the prevalence of childhood obesity (Dagnew et al., 2021; Hovsepian et al., 2015; Kelishadi et al., 2015; Leis et al., 2020). Thus, studies have shown that some 50% of children and adolescents with dyslipidemia and diabetes will continue to have these disorders as adults (Dagnew et al., 2021; Perak et al., 2019). Randomized control trials (RCTs) have shown that inappropriate dietary habits during childhood, such as eating fast food, may increase the prevalence of heart disease, diabetes, hypertension, obesity, mental health problems, iron deficiency, and other conditions (Simbar et al., 2022). Sirikulchayanonta et al. (2022) reported that the rates of overweight and obesity in adults and children have been increasing; thus, from 1975 to 2016, the global prevalence of overnutrition among children and adolescents aged 5 to 19 years more than quadrupled, from 4% to 18%.

Lozano et al. (2016) emphasized that dyslipidemia in childhood is not a disease but, rather, a risk factor for atherosclerosis and may contribute to coronary heart disease (CHD) in adulthood. Likewise, Lertbannaphong et al. (2021) observed that screening young people for dyslipidemia may serve to identify those affected, decrease long-term cholesterol, and prevent or delay cardiovascular events in adulthood but that the evidence made available by the U.S. Preventive Services Task Force (USPSTF) is inadequate when it comes to recommending routine selective or universal lipid screening in childhood. Sirikulchayanonta et al. (2022) identified the eating habits of children, including high caloric intake, insufficient intake of fruits and vegetables, and low physical activity (PA), among the main factors leading to obesity and

dyslipidemia. It has, then, been well demonstrated that poor dietary habits in adolescence are associated with serious health conditions such as obesity, hyperlipidemia, and diabetes in the future (Simbar et al., 2022).

On the other hand, Wang et al. (2017) reported that obesity and type 2 diabetes mellitus (T2DM) increase the risk for many other diseases, such as hypertension, hyperlipidemia, and some cancers. Moreover, the number of patients with T2DM in the United States increased from 26 million in 2010 to 29 million in 2015, and there was an increase of 14% in the total healthcare costs to treat health conditions such as type one diabetes and T2DM. Poor diabetes control has been associated with low socioeconomic status (Wang et al., 2017), and the prevalence of T2DM has been increasing rapidly worldwide over the past two decades in some developing countries, such as China and India. For instance, the rate of diabetes has reached 10% among adults in China, a level similar to that of U.S. adults (Wang et al., 2017). Therefore, the expansion of lower-cost, more effective methods for the treatment and self-management of obesity and diabetes is required to decrease healthcare costs, a large portion of which is directed toward obesity and diabetes, while at the same time improving the quality of care and the life of patients (Wang et al., 2017).

Dagnew et al. (2021) drew attention to the increasing prevalence of chronic conditions such as diabetes and hyperlipidemia in developed countries and emphasized the potential difficulties involved in achieving and sustaining the dietary management of these recurring illnesses, particularly in children and adolescents. Thus, the risk of developing diabetes and hyperlipidemia in this population has increased, in part owing to the increase in obesity rates among children and adolescents, and the management of chronic conditions requires a change in lifestyle and nutritional patterns, which can be difficult to achieve. Since diet and lifestyle

modifications are key factors in the management of these chronic conditions, Sharma et al. (2017) argued that nutrition-based methods, such as the delivery of education regarding changes in lifestyle and diet to parents and caregivers in the community, can be particularly effective in lowering the risk of future chronic health conditions. These researchers proposed a complementary, low-cost, and effective solution for preventing the development of these conditions, observing that a healthy diet can limit the progression of chronic conditions and facilitate the management of their symptoms.

Background

According to Alexandre et al. (2021) and Durbin (2018), a number of factors may influence the dietary management of chronic conditions in children and adolescents, including the perceptions and beliefs of children and adolescents and their parents and caregivers, the availability and accessibility of relevant information and services and support to young people, and the environment in which they live, including the availability of healthy food options and opportunities for physical activity (Alexandre et al., 2021; Durbin, 2018).

Childhood obesity in the United States has tripled over the past four decades, with one in five school-aged children between the ages of six and nine currently being identified as obese (Durbin, 2018). As a result, obesity-related diseases such as diabetes, kidney disease, hypertension, and hyperlipidemia, which have been common in adults, are now a concern in the pediatric population as well. The economic effect on the cost of healthcare for childhood-obesity-related illnesses was recently estimated at $14 billion per year (Durbin, 2018). Lifestyle factors, in particular, a diet high in saturated fat and refined sugars, may put individuals at risk for health conditions such as dyslipidemia, hypertension, obesity, and diabetes. Thus, for example, Yeung et al. (2021) attributed atherosclerotic cardiovascular disease (ASCVD) to poor

nutritional habits that begin in infancy at home and continue to develop through childhood and adolescence into adulthood as significant risk factors. These researchers identified other factors related to the development of dyslipidemia that are genetic, especially familial hypercholesterolemia and lipid abnormalities. These abnormalities can be associated with obesity and interact with lifestyle factors such as hypertriglyceridemia (Yeung et al., 2021).

Diabetes and hyperlipidemia remain significant public health problems in the United States, where over 30 million are afflicted, and estimates project a continued increase in cases (Asbaghi et al., 2020; Liu et al., 2022; Marrero et al., 2021). Significant advances have been made in understanding the risk factors for these chronic conditions and their pathophysiology in children, who comprise a small but, again, growing number of new cases, with a significant increase in the overall incidence observed between 2002 and 2015 (Asbaghi et al., 2020; Liu et al., 2022; Marrero et al., 2021).

Perak et al. (2019) reported favorable trends among young people in the United States in the mean levels of all lipid types—total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), non-HDL-C, triglycerides (TGs), and low-density lipoprotein cholesterol (LDL-C)—over the periods from 1988 to 1994 and from 2007 to 2010 or 2011. However, 20% of young people had adverse levels for at least one lipid in the period from 2011 to 2012. As these researchers observed, the trends in the prevalence of the ideal levels of lipids and apolipoprotein B have not been described for this population.

Scope of the Problem

By shifting the focus of obesity, hyperlipidemia, and diabetes prevention interventions to the early education of parents, it may be possible to change children’s dietary habits significantly so as to decrease the risk of these chronic conditions. Parents’ and caregivers’ knowledge of how

to intervene and the resources available to facilitate making lifestyle and diet modifications have not been studied extensively for the pediatric population (LoRe et al., 2019). Most childhood obesity interventions, for instance, have been designed to target school- aged children, whose unhealthy habits are already established, and, so, have generated minimal effects (LoRe et al., 2019). On the other hand, parenting interventions beginning as young as infancy can impact children's dietary patterns, thus helping to decrease comorbidities such as diabetes and hyperlipidemia irrespective of when or how the parental interventions are established. In addition, other factors may impact the parental knowledge deficit related to demographics, lack of health education, poor nutrition, low self-efficacy, limited social support, and lack of economic resources (Chen et al., 2021).

The dissemination of family-focused prevention programs targeting diabetes and hyperlipidemia in community settings remains rare. Few established preventative programs have directly involved parents or focused on the young people who are at particular risk. Thus, prior efforts have often resulted in diffuse interventions and poor implementation of lifestyle changes at home, where parents exert significant influence over their children's diet, physical environment, and opportunities. The paucity of effective dietary management programs aimed at preventing chronic conditions and adapted for delivery to at-risk families in accessible, affordable, and safe settings remains a critical barrier to reducing population prevalence and the risk of diabetes and hyperlipidemia (Marrero et al., 2021).

The family is, of course, a critical component of community culture. Family and parental cultures are the leading promoters of adherence to measures designed to control chronic conditions and effect salutary changes in behavior and lifestyle. Many cultural obstacles affect the management of chronic conditions, including adaptation to nutritional habits other than those

associated with the consumption of traditional foods. Thus, some families are resilient to make nutritional changes, and the lack of motivation may be a factor. Some families, for example, have a sense of denial of the harshness of these chronic conditions, viewing them as somewhat uncontrollable. Consequently, many children may be at risk of their conditions worsening because of their parents' choice to maintain an unhealthy lifestyle and to miss follow-up appointments and diabetic educational classes (Galitzdorfer, 2020).

Financial limitations and living in low-income areas can also negatively influence the management of the chronic conditions affecting the pediatric population because of the aforementioned limited access to affordable healthy foods. Other issues impeding nutritional management may include insufficient resources for the members of immigrant families, whose legal status and associated fear of attracting the attention of the authorities may limit their access to healthcare (Galitzdorfer, 2020).

Consequences and Significance of the Problem

Failure to control the growth in the number of hyperlipidemia and diabetes cases among children at home through nutritional and lifestyle modifications is likely to result in long-term complications at the macro- and micro-vascular levels, such as glaucoma, retinopathy, chronic kidney disease (CKD), risk of stroke and death, cardiac problems, hypertension, nervous system impairment, amputation, dental disease, and increased susceptibility to infection. The numerous long-term complications associated with these conditions represent a significant economic burden. The estimated cost of diabetes in the United States in 2012 was, for instance, $245 billion ($176 billion in direct costs and $69 billion in indirect costs), and the number of people with diagnosed and undiagnosed diabetes is predicted to increase to 44.1 million by 2034 (Shah et al., 2017).

Other significant consequences of childhood obesity and its comorbidities, including diabetes and hyperlipidemia, can greatly affect children's developmental and physical health, social and emotional well-being, and self-esteem. Thus, Dagnew et al. (2021) emphasized that childhood obesity and its comorbidities are associated with poor academic performance and a lower quality of life. Addressing risk factors for diseases such as diabetes and hyperlipidemia early in childhood can help prevent them from becoming a significant public health problem. In addition, metabolic, cardiovascular, orthopedic, neurological, hepatic, pulmonary, and renal disorders may be a direct consequence of uncontrolled diabetes and hyperlipidemia in infancy and childhood.

The Organizational Assessment

Current State at Primary & Community Care Facility

The Primary and Community Care Facility (PCCF), at which the project described in this study has been implemented, is dedicated to improving the health of its patients and communities by empowering communities and its partners with innovative solutions and investing in providers' success. The PCCF also encourages good health by promoting easy access to healthcare and offering a full array of services, including transportation to and from the facility. However, the facility has not implemented an educative system that targets the risk factors for chronic conditions such as hyperlipidemia and diabetes in its pediatric population.

Recently, more and more pediatric patients in the communities surrounding the PCCF have been presenting with health problems such as hyperlipidemia and diabetes. Thanks to the strong commitment of the facility's practitioners, especially the pediatricians, a correlation has been identified between this increase in chronic conditions and poor dietary management by parents and caregivers. Kelishadi et al. (2015) reported that roughly half of children and

adolescents with dyslipidemia and diabetes continue to have these conditions as adults—a phenomenon that has been observed at the PCCF—but that dietary management can curb the increase in chronic conditions. The barriers to dietary management may include, again, the socioeconomic, family, and legal status of children and their families as well as the complexities of the healthcare system.

Knowledge Gaps

Dietary change, then, is a primary tool for the early self-management of many chronic diseases. To be effective, such change must be supported by a collaborative partnership between the managers of care, that is, pediatricians, and pediatric patients and their families. In addition to the socioeconomic, family, and systemic barriers to effective dietary management of chronic conditions already discussed, there are impediments to children's development of the health behaviors and skills required to minimize the pervasive impact of their conditions on their lives and those of and their caregivers and families, about which too little is known. A further gap in the knowledge of these issues relates to resistance from the family that may follow the prescription of a dietary change in the early stages of a chronic disease.

Such knowledge gaps may add to the burden of care for the members of the pediatric population who suffer from these health conditions. As just mentioned, chronic conditions can disrupt family life, thus increasing the psychosocial pressures associated with the diagnosis of one (Pugh et al., 2021). The distress associated with the developmental stage of children may also complicate efforts to determine the appropriate level of care for managing chronic conditions in the pediatric population.

Another knowledge gap concerns the appropriate educational materials to address parents' lack of knowledge about modifying their children's lifestyle and diet so as to decrease

the risk of chronic conditions that, again, burden the healthcare system and society in general as at-risk children reach adulthood in communities like those surrounding the PCCF. It is important to emphasize the enormous benefits of educating families and caregivers about the significance of nutrition and a healthy lifestyle early in life, with specific attention to improving the quality of the food that children eat in infancy and early childhood, encouraging healthy eating patterns, and restraining the consumption of sugar-containing beverages. The effects of regular PA, avoidance of a sedentary lifestyle, and limiting screen time alone may be small, but these measures are beneficial as part of multi-component approaches. The home environment is, of course, particularly important for young children, and it can be improved by educating and empowering families that the lack resources necessary to access online materials about, in this case, changing nutritional and lifestyle habits and decreasing risk factors for chronic conditions.

Primary Goal of the DNP Quality Improvement Project

A major goal of this Quality Improvement Doctor of Nursing Practice (QI DNP) project was to initiate an educational program at the PCCF directed at parents in the surrounding communities to address dietary management and prevent chronic conditions such as hyperlipidemia and diabetes, including obesity, in the pediatric population. One essential aspect of achieving this goal was to offer effective educational resources to parents and families to enhance the desired dietary changes by encouraging cultural competence in the PCCF and in the communities and establishing relationship-building strategies with healthcare professionals involved in diabetes and hyperlipidemia care. A further goal of this project was to enhance the support to families in this community for accessing healthcare resources and overcoming the obstacles to lifestyle modifications and nutritional changes imposed by inadequate health literacy and cultural barriers.

An additional goal of the project is the improvement of the relationships among healthcare providers, families, and parents. Motivating and cultivating health literacy through education can help parents and families understand the role of good nutrition in improving health outcomes (Tan & Siah, 2022), and educational groups have been associated with improvements in diabetes and hyperlipidemia management (Galitzdorfer, 2020). Thus, the emphasis was on increasing parental knowledge of lifestyle and nutritional modifications that can decrease the risk that children will develop chronic conditions such as hyperlipidemia and diabetes in adulthood. The analysis of the data for this project was also intended to reveal information about the effects of the educational interventions involving the parents of pediatric parents diagnosed with hyperlipidemia and diabetes and their effectiveness in addressing the risks factors for these chronic conditions. Reductions in the lipid profile and diabetes indices, such as glycated hemoglobin (HA1C), LDL, cholesterol, and triglycerides and an increase in HDL over the long term, were among the desired outcomes. Also, the QI project was designed to shed light on the challenges that the parents of pediatric patients face when trying to maintain a healthy diet (Wilke, 2020) and to develop recommendations for them regarding effective dietary management to prevent diabetes and hyperlipidemia. These goals were achieved through the assessment of both the role of community resources in supporting dietary management among pediatric patients and the socioeconomic, cultural, religious, and lifestyle factors with the potential to influence the dietary and nutritional management of the young people in the communities surrounding the PCCF.

Literature Review

Literature Search Question

The question used for the literature search asked whether, among the pediatric patients in these communities, a parental educational intervention introducing dietary management and lifestyle modifications to prevent diabetes and chronic hyperlipidemia was effective compared with no such intervention.

Methods

Inclusion Criteria

The goal of the literature review for this study was to identify recent articles that address the factors that influence dietary management and related lifestyle modifications in childhood and the interventions needed to improve parental education regarding such modifications in order to decrease the risk of children developing chronic conditions in adulthood such as diabetes and hyperlipidemia. To retrieve the most recent data and guarantee the highest level of evidence, the search strategy was limited to systematic reviews, meta-analyses, meta-syntheses, randomized-control-trial studies, peer opinions, and pilot and retrospective studies published in the past five years. The search was also limited to studies containing interventions promoting education about lifestyle changes, nutritional competency, and factors related to increased risk of diabetes and hyperlipidemia written in English. Excluded were studies unrelated to educational intervention and risk factors—though one included study covers the cost and economic consequences of these high-risk components—and those not designed to increase knowledge and awareness of lifestyle modifications and factors that increase the risk of developing diabetes and hyperlipidemia.

Development and Implementation of the Search Strategy

The study question was entered into the search engine in PICOT format, with terms such as “pediatric* patient*” OR “dietary* management*” OR “preventative* measures*” AND “diabetes*” AND “hyperlipidemia*” AND “chronic* diseases*” serving to narrow the results.

The Cochrane Library, CINAHL, PubMed, Dynamic, TRIP Database, and the Florida International University (FIU) library were consulted. The methods included formulating a search strategy, configuring the parameters for the search engine, and determining the appropriate database search operators.

Results

The search yielded 1,000 abstracts from CINAHL, 300 from PubMed, 300 from Dynamic, 455 from TRIP Database, and 1,122 from the FIU library. The Johns Hopkins Evidence Analysis Tool Kit revealed evidence at five distinct levels, including 11 systematic reviews (SRs) and meta-analyses (MAs), 2 randomized control trials (RCTs), 1 pilot study, 1 cross-sectional study, 1 peer opinion, 1 retrospective study, and 1 multilevel analysis study. Figure 1 presents an overview of the search process, and Table 4 in Appendix B presents a summary of the results of the literature review.

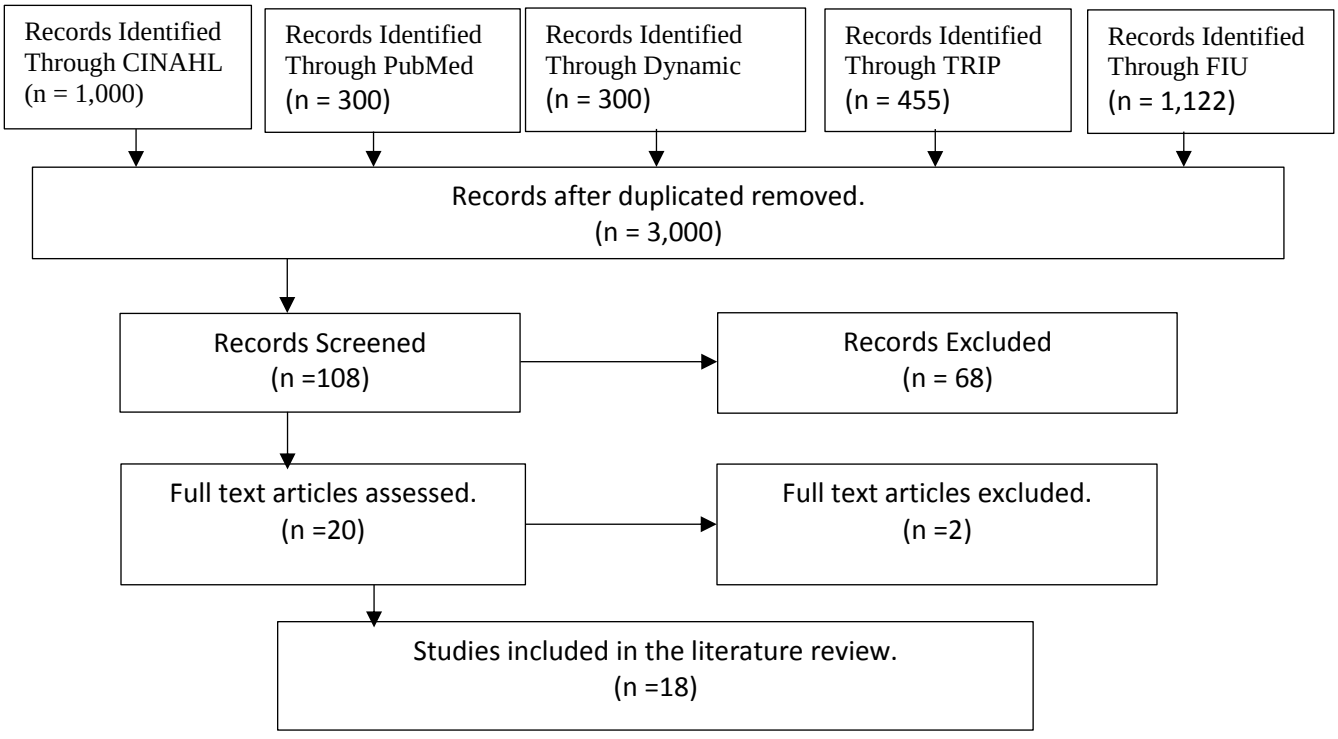

Figure 1. Summary of the literature search process.

Literature Review

Alvarez-Alvarez et al. (2020) conducted an RCT in which they identified minor relationships between the closest adherence to high-quality dietary indices (HQDIs), particularly the Mediterranean-style and Prime Diet Quality Score (PDQS) indices, and the lower prevalence of individual and clustered risk factors among senior and pediatric patients with metabolic syndrome and an increased risk of cardiovascular disease. The sample in this project was obtained by identifying the names of potential participants from the records of more than 200 primary care health centers. The researchers reviewed the medical records and excluded those which did not meet the eligibility criteria. The first eligible participants were men and women from the community aged 55-75 and 60-75 years, respectively; later, adolescent patients free of CVD at the baseline were added. These adolescents were overweight or obese (body mass index [BMI] ≥ 27 and < 40 kg/m^2) and met at least three criteria for metabolic syndrome: fasting glucose ≥ 100 mg/dl, triglycerides ≥ 150 mg/dl, high-density lipoprotein (HDL) cholesterol < 40 mg/dl in men or < 50 mg/dl in women, blood pressure $\geq 130/85$ mmHg, and abdominal obesity in a Caucasian population defined as ≥ 80 cm in women and ≥ 94 cm in men or, in a South American population, ≥ 80 cm in women and ≥ 90 cm in men. The study recruited 6,874 male and female participants with overweight/obesity and metabolic syndrome from October 2013 to December 2016 in 23 Spanish centers.

The researchers used PREDIMED-Plus to collect their data from the 6,874 participants. The prevalence of four cardiovascular risk factors (CVRFs), hypertension, obesity, diabetes, and dyslipidemia, measured based on the standard diagnostic criteria, were considered as outcomes. The researchers calculated the adherence to lifestyle modifications to eight along with a priori-defined dietary index. In addition, they tailored their multivariable models to assess the

differences in the mean values of the factors and prevalence ratios for the individual and clustered CVRFs.

Among the limitations of the study recognized by the researchers, first, there was a possibility of reverse causation bias, which is a major limitation intrinsic to the cross-sectional study design. Second, the choice of the study population, consisting of older adults and adolescents with metabolic syndrome, imposed a limitation on the findings in that they may not be directly applicable to younger or healthier populations, including toddlers and infants. In addition, the researchers did not use limit values to describe obesity in this population. Another limitation is the potential seasonal variation in the dietary patterns of the participants, though the researchers did not expect great changes in dietary patterns since the participants completed the food-frequency questionnaire with reference to the entire previous year, and they also pointed out that their use of self-reported dietary information might lead to some level of misclassification.

Summarizing these findings, Alvarez-Alvarez et al. (2020) drew particular attention to the closest adherence to dietary quality indices, especially the Mediterranean-style and PDQS scores, which were associated with a lower prevalence of individual and clustered CVRFs among the participants with metabolic syndrome who were at high risk of cardiovascular disease. In addition, the highest consistency to any dietary pattern did not exhibit inverse relationships with hypertension. Likewise, the modified Mediterranean Diet Score (PR = 0.95; 95% CI 0.90–0.99), the Mediterranean Diet Adherence Score (MEDAS; PR = 0.94; 95% CI 0.89–0.98), the pro-vegetarian dietary pattern (PR = 0.95; 95% CI 0.90–0.99), and the Alternate Healthy Eating Index 2010 (PR = 0.92; 95% CI 0.87–0.96) were inversely associated with the prevalence of obesity. There was also a significant inverse trend among the participants who more closely

adhered to the Mediterranean and pro-vegetarian diet in the mean number of CVRFs across the categories of adherence. Lastly, closer adherence to several HQDIs was associated with improved blood lipid profiles and anthropometric measures.

By contrast, a study by Chauhan and Paunikar (2014) found that, between 1988 and 1994 and 2007 and 2010, the serum lipid levels of children and adolescents (defined as 6 to 19 years of age) improved with diet management. They used a peer opinion study to collect data, providing guidelines to physicians regarding the screening and management of pediatric hyperlipidemia. Their schematic approach was intended to improve primary care physicians' decision-making about treatment, and they emphasized their expectation that adherence to the guidelines would eventually decrease the costs of healthcare through early identification of and interventions for chronic conditions. One of their key findings was that the data derived from the National Health and Nutrition Examination Survey has shown favorable trends in serum lipid levels among children and adolescents. In addition, the mean TC decreased from 165 to 160 mg/dl, and the prevalence of elevated TC decreased from 11.3 to 8.1%. However, from 2007 to 2010, approximately 20% of children aged 9 to 11 had either low HDL-C or high non-HDL-C. This finding guarantees further evaluation following the National Heart Lung and Blood Institute (NHBLI) guidelines.

In their SR and MA study, Dagnew et al. (2021), unlike Alvarez-Alvarez et al. (2020) and Chauhan and Paunikar (2014), focused on the observation that patients with diabetes mellitus (DM) often suffer from dyslipidemia and an increased the risk of cardiovascular problems, thus providing additional evidence of the critical need for a strict commitment to DM medication to prevent alterations in the circulatory lipid profile and the associated consequences. Their sample consisted of 18 primary studies that included 4,961 participants living with DM,

thus meeting the eligibility criteria for an MA of hypertriglyceridemia. They based their reporting and registration method on the principles that the Centre for Reviews and Dissemination offers as guidance for reviews of healthcare literature. The reporting system took the form of a Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA). The data search relied on major databases, specifically, PubMed, Hinari, African Journals Online, and Google Scholar as well as the institutional repository of Addis Ababa University for unpublished data. These researchers acknowledged as limitations of their study, first, the fact that the participants included were not representative of the national population, to which it cannot be generalized, though they pointed out that this limitation can be viewed positively since it was a pooled prevalence of others. Another limitation was high heterogeneity, so the researchers conducted a random-effects subgroup analysis and meta-regression analysis to identify the real cause of the variation as a type of DM. A further limitation was a shortage of studies in some parts of the country each year, where the results may not be sufficiently applicable to serve as a baseline. Ultimately, the authors included studies that needed associated factors of dyslipidemia that impeded studies on the pooled effect of individual components on plasma lipid abnormalities.

The key findings that Dagnew et al. (2021) reported were, first, that dyslipidemia is among the leading causes of cardiovascular complications in DM patients. Though dyslipidemia is a major public health problem in undeveloped and developed countries worldwide, there has not yet been a nationwide study to determine its occurrence in DM patients yet. Therefore, the researchers' aim was to estimate the prevalence of hypertriglyceridemia and other plasma lipid abnormalities among people living with DM, with an emphasis on the high prevalence of hypertriglyceridemia and other lipid abnormalities among DM patients in these countries. They

strongly suggested directing maximal attention to adherence to DM management as a means to reduce circulatory lipid profile abnormalities and subsequent complications.

Durbin (2018), on the other hand, conducted an SR and concluded that childhood obesity can be mitigated by encouraging active play and healthy eating. In addition, research-based practices can improve children's health and wellness while cutting down on the healthcare spending associated with obesity. The sample for this SR consisted of four studies: an RCT on the effects of a 10-week FATmax training exercise program on obese boys 8 to 10 years of age, a cross-sectional (CS) study of the correlation among PAs, sedentary behavior, BMI, and obesity involving 6,539 children between 9 and 11 years of age, an RCT of the effects of a walking program on the BMI of children aged 6 to 11, and an SR on the effectiveness of school-based dietary behavior and PA in children and adolescents aged 6 to 18. The data collection involved a search for relevant literature in The Cochrane Library, CINAHL, PubMed, Medline, SPORTDiscus, and Health Source: Nursing/Academic Edition published between January 2012 and February 2017.

The researcher selected the articles based on the dates of publication and interventions used, looking in particular at the measures of PA, exercise, diet, and outcomes, among which the BMI is used most widely to measure obesity and weight status in the pediatric population. A key finding of the analysis was that obesity declined when the children engaged in adequate PA and ate balanced meals. In addition, incorporating evidence-based practices (EBPs) into care can, again, promote health and wellness in pediatric populations and reduce the healthcare costs associated with obesity. The researcher considered the use of the BMI to measure obesity a limitation, in that it measures excess body weight indirectly and does not measure excess body fat, noting that age, sex, ethnicity, muscle mass, fat, or fat-free mass may affect the relationship

between the BMI and body fat. Likewise, the BMI provides no indication of the distribution of fat among individuals because it does not differentiate excess fat, muscle, and bone mass. Lastly, the BMI does not indicate changes and impacts that can affect the accuracy of the measurement.

An SR of diabetic medicine by Hermanns (2020) also emphasized the need to shift the focus of diabetes education from patients' compliance to their knowledge, independence, and self-management. Digital solutions can facilitate this shift and have shown encouraging outcomes and significant potential. The researcher concluded that more work remains to be done in terms of incorporating diabetes self-management education into standard clinical practice. The review began with a search of the key electronic databases, including PubMed and Google Scholar, for German- and English-language MAs of diabetes self-management, education, glycemic control, and mental health. The researcher concluded that terms such as "diabetes education" and "diabetes self-management education (DSME)" may be used, though the content of DSME and the meanings of the terms differed across the included studies, and acknowledged that these findings are subject to the same bias as the individual MAs and that the same study could be incorporated into more than one MA but appraisal of the quality of all of the studies would have been beyond the scope of a narrative review. The researcher also emphasized that, based on the I2 statistic as a measure of heterogeneity and the number of RCTs in the sample, the effect estimates seem to suggest that DSME is consistently effective. Also, most of the studies included in this SR did not indicate the fidelity measures, so the degree to which the DSME programs discussed were realized or their conduct was in line with their curricula remains unclear.

Hermanns's key findings are that DM education has advanced from a compliance- and knowledge-tailored approach to an empowerment- and self-management-oriented approach that

seems to have a stronger effect in terms of improving glycemic outcomes than mental health outcomes. Though technological developments and digitalization present both opportunities and challenges for DSME, the results have been promising in terms of enhancing the effectiveness of the education and providing ongoing support. The researcher identified the implementation of this type of education in routine clinical care as an ongoing challenge and concluded that, while it is an essential part of diabetes therapy, there are currently limits to its efficacy, and researchers should investigate the use of technology to overcome these limits.

Marrero et al. (2021) proposed an RCT interventional study of an intervention program for the prevention of T2DM that could be pivotal in shaping a strategy applicable to a wide range of federally qualified health centers that treat diabetes-affected people. The sample for the research would consist mainly of Hispanic individuals, around a third of whom were expected to prefer to participate in Spanish-language groups. The data collection for the proposed EPIC El Rio Families initiative (for “encourage, practice, and inspire changes in El Rio families”) would focus on individuals at especially high risk for T2DM. The EBP interventional content and strategies would support lifestyle behavioral modifications and extensive leverage of medical infrastructure and personnel to address key social determinants of health and expand the program with respect to its impact and sustainability in the home.

The specific aim of the proposed intervention is to reduce excess body weight (primary outcome), hemoglobin A1c, and blood pressure and effect changes in lifestyle behaviors associated with weight trajectory and T2DM risk. The intervention would target mothers with children aged 8 to 12. The evaluation of the intervention would take place over a 13-week period. The sample would include 60 mothers and their children recruited and randomized to either the intervention or to the wait-listed control group at one of two Federally Qualified

Health Center (FQHC) locations. The intervention group of participants (n = 30) would begin the program immediately, and the wait-listed controls (n = 30) would receive a booklet explaining self-guided approaches to behavior change. In addition, the researchers evaluated the delivery costs of the program, the acceptability of the participants to the program, the FQHC staff, and the potential for long-term sustainability were evaluated.

The researchers noted some limitations to the proposed study, including barriers such as interventions, relating to its optimization for dissemination in large-volume primary care settings since the approach was initially designed for use in community settings. Affirming that very few programs have simultaneously targeted mothers at risk for T2DM and their children, they predicted that the successful completion of the proposal would yield a scalable program well-suited for replication and dissemination. In addition, Marrero et al. estimated the effects of the intervention in terms of making families who use the FQHC system aware of T2DM prevention efforts. The results of the proposed study could be crucial for efforts to create a T2DM prevention prototype that is applicable and scalable across the portion of the FQHCs serving the population that is affected by T2DM.

An SR by Pugh et al. (2021) both confirmed that the key to the self-management of pediatric chronic disease is gathering the perspectives of children, parents, and other stakeholders on the factors that influence dietary change early in life and identified the enablers of and barriers to dietary change, including with respect to education, parents/caregivers, and self-management. The researchers cross-referenced seven databases from 2000 to 2018 to identify empirical research (qualitative, quantitative, and mixed methods), including grey literature, using methodological quality to assess the use of validated scoring systems. The search yielded six studies that met the criteria for inclusion in the review. Analysis of these studies served to

identify a set of themes relating to the topic of interest: (1) the role of education, (2) the role of parents and caregivers, (3) the role of self-management, and (4) the identification of enablers and barriers to dietary change. Regarding the samples for the six studies, that of Coleman et al. (2010) consisted of 62 Hispanic children and 82 Hispanic parents enrolled in a program that provided education in Spanish, that of Shroff et al. (2012) consisted of 42 children, with 20 completing each arm, that of Stapleton et al. (2001) consisted of 42 children and 55 caregivers, that of Niggemann et al. (2001) consisted of 73 infants, and that of Ball et al. (2005) consisted of the parents of 505 chronically ill children and adolescents. The researchers identified among the limitations of their SR the parents' inability to participate in educational classes and workshops, the families' prolonged resistance to change, the disease burden, blood testing, children's refusal, the cost of specialized dietary products, frequent monitoring, and the loose stools, nausea, and vomiting reported during the studies. They also mentioned concerns about the commercially offered protein powders and other products alleging special therapeutic benefits. They identified the four themes listed above as their key findings and concluded that the perceptions of children, parents, and other stakeholders on the factors affecting early dietary change are central to the self-management of childhood chronic disease.

The pilot study by Sawicki et al. (2019) differs from the studies just discussed, especially that of Pugh et al. (2021), in presenting a list of options that, in combination with existing guidelines for the dissemination and implementation of research findings, researchers, practitioners, and policymakers can consult to assess ways to simplify and/or expedite the execution of early care and education (ECE) policies designed to prevent childhood obesity and the risks associated with it, such as hyperlipidemia and diabetes, in the pediatric population. The sample consisted of state and local government agency leaders who were accountable for policy

oversight and state personnel and contractors who functioned as intermediaries to direct implementers, whom the researchers interviewed, along with the directors at the ECE centers in the Denver, Colorado area. The researchers also conducted site visits at 21 ECE centers based on the feasibility, percentage of low-income families, and racial and ethnic diversity at each center, 7 of which participated. To collect the data and create the menu, they condensed and categorized some factors identified in previous studies and through fieldwork by arranging them within domains and then added factors to the menu by performing the semi-structured interviews during a pilot test evaluating the execution of ECE regulations in Colorado. The researchers identified as their key findings in this regard their measurements of the minor and major facilitators of and impediments to the implementation of childhood obesity prevention regulations in ECE settings and the inclusion of 7 domains and 39 factors in the menu that influenced the execution of the regulations, 7 of which facilitated the ECE policies (4 major and 3 minor) and 2 of which represented major impediments. More specifically, the major facilitating factors were buy-in from parents and caregivers, the training and communication provided by government authorities and their contractors, and the minimal change needed in the regulations. The major impeding factors were the timing of implementation and the difficulty of balancing of the demands of the regulations against other priorities. The researchers identified as the limitations to their pilot study the breadth of the factors since the purpose of the menu was to enable generalizability and cross-review, and the potential for the menu application to result in the loss of some of the distinctions of the process of implementation. Moreover, their use of a convenience sample and evaluation of a single policy from a single state, at least in theory, influenced the number and type of factors associated with the menu and their relative significance (i.e., whether they were considered major or minor).

Shah et al. (2017) conducted a cross-sectional study, whereas the studies discussed thus far focused on interventional programs for the education and promotion of lifestyle modifications and nutritional changes. These researchers argued that supportive environments and supportive policies are needed to encourage participation in education programs and calculated that the United States could save billions of dollars annually on costs related to T2DM if its population, including children, would adhere to PA guidelines. For their sample, they used the 2013 prevalence data for not meeting the guidelines for 2012 since the behavioral risk factor surveillance system (BRFSS) questionnaire did not include this variable in 2012 and its prevalence had not changed in the last period. They defined physical inactivity (PI) as the prevalence of adults and adolescents who were informed about the spending of no time in leisure-time physical activity (LTPA) and defined the outcome variable as the direct medical costs of T2DM linked to the two exposures.

The researchers collected the PA prevalence data from the BRFSS to assess the population-attributable risk percentage for T2DM and also related the data to the prevalence and cost data for T2DM. In this way, they estimated the costs associated with the failure to meet the PA guidelines and the inactivity associated with the disease in 2012. They identified among the limitations of the study their use of the cost attributable in 2012 and the prevalence of the failure to meet the guidelines, rather than the LTPA, based on the assumption that the prevalence estimates remained largely unchanged for the previous 15 to 20 years. Over all, they observed that, from 1990 to 2000, the levels of LTPA were stable or improved slightly while, at the same time, work-related, transportation, and household activities decreased and PI increased.

Shah et al. reported as their key findings their estimate of the costs of T2DM in the United States in 2012 associated with the failure to follow the PA guidelines at $18.3 billion

(based on a range of estimates from $10.19 to $27.43 billion) and of the cost of PI at $4.65 billion (based on a range of estimates from $2.59 billion to $6.98 billion). They concluded that billions of dollars could be saved annually on the treatment of T2DM alone if the entire U.S. population met the PA guidelines, and they urged the prioritization of support for PA, especially at the environmental and policy levels.

Yeung et al. (2021), taking a different approach, highlighted in their SR the observation of significant reductions in total cholesterol and systolic and diastolic blood pressure in participants who adopted the Dietary Approaches to Stop Hypertension (DASH) diet. Such nutritional strategies, they noted, had been shown previously to reduce the risk of cardiovascular disease. They also strongly encouraged screening for ASCVD and noted that genetic testing allows for enhanced awareness of dyslipidemia and greater focus on intervention and pharmacological treatments that have a good safety record and pediatric patients diagnosed with dyslipidemia and can decrease the risk of ASCVD in adults, though they acknowledged that much of what is known about dyslipidemia in children has been deduced from data collected from adults. In light of a recent increase in research studies of the pediatric population intended to contribute to improvements in the diagnosis and management of these conditions, the main objective of their SR was to summarize the types of dyslipidemia frequently encountered in infancy and adolescence and approaches to screening, diagnosis, and management.

Hajhashemy et al. (2022) conducted a diet-focused SR and found that individuals who consumed especially high levels of dietary calcium (Ca) had relatively low levels of TGs, bad cholesterol (LDL-C), and good cholesterol (HDL-C) in their blood compared with those who consumed the least levels of calcium, though they observed no statistically significant association between dietary Ca and the risk of hyperlipidemia or dyslipidemia. They obtained

their sample by combining estimates from 11 studies including 33,304 subjects based on a search of epidemiological studies to April 2021 in the Medline (PubMed), Scopus, Web of Science (ISI), and Google Scholar databases. This last considered dietary calcium consumption as the exposure and reported a risk of hyperlipidemia and elevated concentrations of blood lipids and lipoproteins. Their analysis also included 19 cross-sectional studies.

Combining and analyzing the estimates from 11 studies, then, the researchers found that the circulating TG concentration in individuals who consumed especially large amounts of dietary Ca was 5.94 mg/dL lower than the level in those who consumed especially small amounts. Likewise, the members of the former group had circulating LDL-C levels that were 4.02 mg/dL lower, and blood HDL-C levels that were 1.56 mg/dL higher, than the members of the latter group. Though their MA of 13 studies, including 38,714 participants, showed no substantial relationship between dietary Ca intake and the likelihood of developing dyslipidemia or hyperlipidemia in the population as a whole, the comparison of the group with the highest Ca intake with the group with the lowest Ca intake was related to a decrease of 42% in the likelihood of low blood HDL-c levels for the female subjects and an increase of 41% in the likelihood for the male subjects.

Hajhashemy et al. identified as limitations to their study, first, the fact that only a few integrated studies collected information about individuals' dietary, supplemental, plant-based, and animal-based Ca consumption, for which reason they could only report raw dietary Ca intake as the exposure. Accordingly, they called for additional study of the association between individuals' Ca intake from various sources and their lipid profiles. Second, some of the included studies did not take into consideration the influence of confounders. Third, the concentrations of Ca intake varied across the studies such that, in some studies, the lowest-consumption group

consumed almost the same amount as the mean- or median-consumption group in other studies. The researchers concluded that the limitations could enhance the between-study heterogeneity, which was not totally removed, even after meta-regression analyses, while the data were insufficient for linear and non-linear dose-response analysis, so they were unable to specify the level of dietary Ca intake that would have a beneficial impact on serum lipid profiles. They identified as their key finding that individuals with very high dietary Ca intake may have lower concentrations of blood TG and LDL-C and higher concentrations of HDL-C than comparable individuals with very low calcium intake, but they observed no substantial connection between Ca consumption and hyperlipidemia.

Chiavaroli et al. (2018) recommended, based on an SR and MA of controlled trials, the portfolio nutritional pattern (PNP) and the National Cholesterol Education Program (NCEP) Step-II diet, which, they found, significantly reduced the primary outcome of LDL-C, non-HDL-C, apolipoprotein B (apo B), TC, TG, systolic and diastolic blood pressure (BP), and C-reactive protein. Their sample consisted of 439 individuals with hyperlipidemia identified through a search of the MEDLINE, EMBASE, and Cochrane Library electronic databases to April 19, 2018. Included were controlled trials lasting more than three weeks evaluating the impact of the PNP on the cardiometabolic risk factors associated with an energy-matched control diet free of the PNP components. In addition, two independent reviewers obtained data and assessed the risk of bias. The initial outcome reported was lower LDL-C. The generic inverse-variance method also served to combine the data and express them as mean differences with 95% confidence intervals (CIs). The Cochran Q statistic served to assess heterogeneity and the I2 statistic to quantify it, while GRADE served to assess the certainty of the evidence.

Chiavaroli et al. (2018) identified among the limitations of their study the fact that they could not rule out irrelevant consequences of the PNP relating to these outcomes, so this decreased the evidence for imprecision. They did not perceive any biological reason to suppose that the PNP would have different effects in people with diabetes since each individual component has been shown to lower LDL-C. Another potential limitation is the variation in the treatment effects across the trials for LDL-C, TC, TG, non-HDL-C, apo B, and the 10-year CHD risk. Further, the researchers did not reduce the evidence for serious irregularity, for previous sensitivity analyses served to clarify the evidence of heterogeneity in each case, the implication being that adherence to the components of the PNP is essential to realizing its intended benefits. One of their key findings is that the 7 trial evaluations involving 439 participants with hyperlipidemia in which the PNP was given contextually of an NCEP Step II diet met the eligibility criteria. Further, the combination of the PNP and NCEP Step II diets significantly decreased the LDL-C (by 17%) as well as non-HDL-C, apo B, TC, TG, systolic and diastolic blood pressure, C-reactive protein, and the estimated 10-year CHD risk compared with the NCEP Step 2 diet alone. The researchers observed no effect of the treatment on HDL-C or body weight, however.

Shaw et al. (2014) reported that patients with chronic illnesses such as diabetes, hypertension, and hyperlipidemia may benefit from a combined-team strategy that makes use of nurse-managed protocols. They based their SR and MA on a search of 2,954 studies, among which they identified 18 using registered nurses (RNs) or equivalents as a sample of individuals who titrate medications. The search used the MEDLINE, Cochrane Central Register of Controlled Trials, EMBASE, and CINAHL electronic databases from January 1980 through January 2014. The researchers also enlisted two reviewers to check the eligibility criteria by

assessing all of the titles, abstracts, and full texts and a reviewer to abstract and perform quality assessments, which were checked by another reviewer. They identified among the limitations of their study the limited descriptions of the interventions and protocols used. The key findings included the potential positive effects of the use of nurse-managed protocols and the team approach by RNs on the outpatient management of chronic conditions, such as diabetes, hypertension, and hyperlipidemia. Their MA demonstrated that the hemoglobin A1c (HbA1c) level decreased by 0.4%, the systolic and diastolic BP by 3.68 mm Hg, the TC level by 0.24 mmol/L (9.37 mg/dL), and the LDL-C level by 0.31 mmol/L.

Tan et al. (2019) conducted an SR and MA to assess the effectiveness of education in promoting medication adherence for patients with hypertension, hyperlipidemia, and diabetes and found that, across 18 RCTs, the educational interventions indeed had this effect. They concluded that improving health knowledge education increases drug adherence. Their sample consisted of 940 participants and involved comparison of the low- to moderate-intensity PA interventions with the standard of care without PA. They included a cluster RCT and enlisted two reviewers to use the Cochrane Risk of Bias Tool to extract the data and assess the bias risk. They also calculated the RevMan, Cochran Q, and Z scores to perform the MA, assess heterogeneity, and evaluate the overall effect. They identified among the limitations of their study the fact that the vast majority of the studies that they analyzed reported the mean age of the participants to be over 65, while the inferences drawn from the studies that included individuals under the age of 65 might not be applicable to the elderly. A further limitation was the narrow scope of the research, in that they found no studies that looked solely at low-intensity exercises, though the goal of their study was to compare low- and moderate-intensity workouts. In addition, the participants reported hyperlipidemia as well as T2DM and hypertension, so the data

extraction and subsequent shared results were less complete than they might otherwise have been, and a discrepancy was observable in that the results may have been affected by the failure of the authors of several of the studies measuring blood glucose to indicate whether this was done fasting or postprandial. The small sample sizes and the diverse outcomes' high levels of heterogeneity represent further limitations. The researchers identified as their key find that low- to moderate-intensity exercise significantly decreased systolic BP and increased HDL values, while a successive subgroup analysis showed no noticeable change in systolic BP readings, and too few relevant studies were available for them to compare thHDL and HbA1C values.

Polonsky et al. (2020) conducted a retrospective study of the effectiveness of education on medication adherence for patients with hypertension, hyperlipidemia, and diabetes. They emphasized the variety of lipid abnormalities that primary care physicians identify and reference after cholesterol screening and argued that current dietary therapy was effective for those with high LDL-C levels. The sample consisted of 209 patients seen over a 27-month period and whom a doctor of library science interviewed and evaluated on their initial visit. The patients' family members evaluated their lipid values, with successive fasting levels being assessed at the physicians' discretion. The patients' TC, HDL-C, and TG levels were measured in a clinic, their LDL-C was assessed using the Friedewald equation, TC - (HDL-C) - (TG/5), and the lipid values from all of their records were documented. The first phase of the study involved collection and classification of the participants' demographic data, with an X 2 analysis serving to examine changes in age and gender. They identified among the limitations of their study the inconsistency in the dietary surveys for documenting the subjects' previous diet or subsequent compliance though each family received counseling with a dietician during the preliminary visit. Also, the results would not be valid if the improvements in lipid values were due entirely to dietary

changes or some other factor. In addition, they noted that TC and LDL-C levels have been observed to decrease during puberty, and this decrease could be confused with the patients' efforts to improve their lipid levels. The researchers further emphasized the diversity of lipid abnormalities that primary care physicians discover and mention after cholesterol screening and argued in favor of the efficacy of current dietary therapy in patients with elevated LDL-C levels.

Modesti et al. (2016) reported that lifestyle modification was very effective for the Asian population as well, suggesting that this strategy, being focused on the community rather than the individual, might be especially beneficial when dealing with ethnic minority populations. Their MA of RCTs examining the effect of lifestyle interventions in preventing new T2DM in Asian populations based on the identification of high-risk individuals began with a systematic search of the PubMed and Embase electronic databases for research published from January 1994 to December 2014. The researchers identified among the limitations of their review the focus on published RCTs to the exclusion of observational studies and unpublished literature, noting that, though RCTs generally provide the maximum validity and causal inference, relevant non-RCTs performed at the community level may have been lost. Second, only one RCT study included Asian subjects living in Europe, so additional research is needed targeting this population. Third, the sample included no subjects from the Americas or Africa and, therefore, was not generalizable to those populations. Again, the finding that the lifestyle interventions were highly effective in the Asian population suggested that such efforts targeting minority populations are more effective when directed more at the community than the individual level.

Sikand et al. (2018) conducted an SR and MA and found that multiple one-on-one sessions resulted in appreciable improvements with respect to lipid profile, BMI, glycemic status, and blood pressure. The sample included 34 primary studies involving 5,704 participants.

The search strategy was to identify English-language full-text research articles published between January 2003 and October 2014 using the PubMed, Medline, and Worldcat.org databases to detect research that addresses specifically the clinical application and cost-effectiveness of medical nutrition therapy (MNT) for dyslipidemia and involves at least one outcome measure of dyslipidemia, whether TC, LDH-C, TG, HDL-C, and/or a metabolic syndrome. They identified among the limitations of their study the fact that lipid and cardiometabolic outcomes were not measured in all of the included studies and that the number of MNT sessions and the time spent in MNT with a registered dietitian nutritionist (RDN) were not regularly reported. Second, the subjects enrolled in the studies were adults who varied with respect to age, gender, and type of CVD risk factors and their characteristics in each study. The interventions varied as well with respect to type, length, setting, configuration, and delivery methods, and this variation could have contributed to the moderate heterogeneity statistics for some of the outcomes. Lastly, the behavioral interventions were described as complex, so the likelihood of inconsistency in their administration across the included studies was relatively high. The researchers reported as their main findings, first, that many of those who participated in the face-to-face MNT sessions with an RDN during the 3- to 21-month period showed significant improvements with respect to lipid profile, BMI, glycemic status, and BP. They summarized the results as mean differences with 95% confidence intervals when MA was possible. Their analysis also showed that the MNT interventions lowered LDH-C, TG, fasting blood glucose, HbA1C levels, and the BMI for the members of the treatment groups compared with the members of the control groups. The researchers concluded that the multiple MNT sessions with an RDN represented a clinically effective treatment for dyslipidemia and patients

with cardiometabolic risk factors that was also cost-effective, in part because of the patients' reduced use of medication, and supported superior quality-adjusted life years.

In a multilevel analysis, Ayele et al. (2022) emphasized that infant obesity is becoming increasingly problematic and burdensome in emerging countries and focused on sub-Saharan Africa (SSA). There, they reported, 1 in 20 children under five years of age was overweight or obese and that males in this age group born to educated mothers living in the South African region, as well as older children, were especially likely to become overweight or obese. They advised the authorities in the SSA nations to act quickly to reverse these trends and avoid the double burden of undernutrition. Their sample included 192,132 participants under five. They collected the data from recent nationally representative demographic and health survey datasets from 33 SSA countries and determined the prevalence of overweight or obese children under five using random-effects MA commands. They also conducted a multivariable, multilevel, mixed-effects logistic regression analysis to distinguish factors associated with the prevalence of overweight and/or obesity in this population, with a P-value less than 0.05 serving to establish statistical significance. The researchers identified among the limitations of their study the fact that it was performed using a nationally representative, multi-country dataset that, while having the potential to enhance the generalizability across the region and providing unbiased effect-size estimates through monitoring of the dependency of the data using multilevel analysis, nevertheless, was gathered cross-sectionally using self-reported interviews, which are prone to recall and social desirability bias. They identified as their key findings that childhood obesity is becoming a significant challenge and a double burden for developing nations, with 5% of children in SSA being overweight or obese and, again, the male participants under five born to educated mothers in the South African region being at higher risk of becoming overweight or

obese. Accordingly, they encouraged the authorities in SSA countries to apply early interventions to reverse the trend and avoid the double burden of undernutrition.

PICO Question and Hypotheses

The aim of this QI project was to answer the PICO question, "Among pediatric patients in communities, will a parental educational intervention addressing dietary management and lifestyle modifications prevent diabetes and chronic hyperlipidemia compared with no parental education interventions?"

- Population **(P)**: pediatric patients in communities
- Intervention **(I)**: parental educational intervention addressing dietary management and lifestyle modifications
- Comparison **(C)**: no parental education intervention
- Outcomes **(O)**: prevent diabetes and chronic hyperlipidemia.

Definitions of Terms

The following terms are described conceptually and operationally for the common perception of the research project.

***Hyperlipidemia*.** This umbrella term describes abnormally high levels of any or all lipids or lipoproteins in the blood resulting from various acquired or genetic disorders (Liu et al., 2022)

***Diabetes*.** This term describes a group of metabolic disorders characterized by high blood sugar (hyperglycemia) over a prolonged period with symptoms including frequent urination and increased thirst and appetite that require patients to incorporate treatment behaviors into daily living (Hosono & Tochikawa, 2022).

***Variable (T0*).** This variable is the total score on the pre-test questionnaire completed by the parents at the baseline.

***Variable (T1*).** This variable is the total score on the post-test completed by the parents on their knowledge of nutrition and lifestyle modifications acquired through the educational intervention.

Variable (T [Overall]). This variable represents the percentage of the total score.

Nutrition. This term describes an essential aspect of growth and development, building the immune system, decreasing the risk associated with non-communicable diseases, and increasing the length of life (World Health Organization, 2022).

Physical activity (PA). This term describes at least 60 minutes of aerobic, muscle, or weight-bearing activities (American Academy of Pediatrics [AAP], 2017).

Body mass index (BMI). This term describes a screening tool; the value is calculated by dividing weight by the square of height (kg/m^2) and is then interpreted based on a graph-based BMI-for-age growth plot (AAP, 2017). The BMI serves to assess nutritional status and overall health.

Overweight. A condition defined as having a BMI ≥ 85th percentile but ≤ 95th percentile (AAP, 2017). Persons who are overweight are at risk of poor health due to excessive adipose tissue

Obese. A condition defined as having a BMI ≥ 95th percentile (AAP, 2017). Persons who are obese are at risk of poor health due to excessive adipose tissue.

Theoretical Framework for the Project

Nola Pender's health promotion theory and Lewin and Schein's change theory guided this project. Pender's theory served to assess changing human behavior with an emphasis on primary prevention and promoting health. The motivations for healthy behavior changes, including achieving dietary management for the prevention of chronic conditions such as

diabetes and hyperlipidemia, may be based on the need to prevent illness (primary prevention) or the desire to achieve greater well-being and self-actualization (health promotion; Bredow, 2017). Lewin and Schein's change theory, consisting of three stages (Coghlan, 2021), served to structure the present project. The first stage, unfreezing, involved finding pediatric patients diagnosed with or at risk for diabetes and hyperlipidemia and determining through questions and interviews whether they and their family members were motivated and ready to make lifestyle and diet modifications and then gathering in-depth insights into the challenges associated with trying to maintain a healthy diet. During the second stage, which involved being unfrozen and moving to a new state, pamphlets provided instruction about administering diet modification and lifestyle changes during interactions with parents and patients that emphasized the need for change. In the third stage, refreezing, parents were followed to evaluate the knowledge acquired to achieve a permanent change. During this phase, the research team also conducted interviews with community members who worked with the pediatric patients to learn about the resources available to help them with dietary management.

Methods

Nutritional knowledge is needed to determine the need for interventions and employ approaches that decrease the burden of disease and promote well-being (Thompson et al., 2021). The GNKQ was developed by Parmenter and Wardle in the United Kingdom in 1999 and validated for Australia in 2008 (Thompson et al., 2021). It meets the psychometric criteria for internal reliability, construct validity, and test-retest validity (Krabbe, 2020) and is appropriate for assessing the effectiveness of nutrition knowledge-based interventions for public health programmers, clinicians, and researchers (Thompson et al., 2021). The questionnaire, presented in Appendix A, served in this QI project as a pre-test and post-test to measure the level of

nutritional knowledge before and after parents received the educational intervention. The GNKQ instrument used in this study consisted of four sections that assessed distinct aspects of nutritional knowledge combined for the total score: Dietary Recommendations (DR), 18 questions; Source of Nutrients in Food (SON), 36 questions; Knowledge of Healthy Food Choices (HFC), 13 questions; and Diet, Disease, and Weight Management (DDWM), 21 questions (Krabbe, 2020).

A relatively high score on the GNKQ indicates a relatively high level of nutrition knowledge. Correct answers are worth one point, and total scores range from 0-88. The questionnaire employs various question styles, including multiple-choice, yes/no, agree/disagree items, and questions that require the respondents to make food choices. As mentioned, the results are expressed as the means with the standard deviations, the overall range of correct answers, and the percentage of the mean. The performance of validity and reliability studies on the GNKQ both as a whole and by section allowed for the separate measurement of each section when necessary. The demographic assessment collected information about factors that may affect nutrition knowledge, including gender, height, weight, health status, marital status, children, ethnicity, highest level of education completed, and the nutrition-related qualifications (Lawrence et al., 2016).

The pretest, using the variable analyzed by the GNKQ, *T0*, was administered to the parents before the education intervention. Lasting approximately 15 to 20 minutes, it measured their current knowledge of nutrition. The parents then received educational information about diet and lifestyle modifications using MyPlate and brochures along with PowerPoint presentations. The information included plate portion size, the interpretation of the nutritional labels on products, the relationship between healthy eating and good health, and

recommendations for PA. The parents completed the educational portion of the project either on the same day or about two months later at a follow-up appointment at the PCCF depending on their availability. The parents then had the opportunity to complete the GNKQ again for the post-test to measure the variable *T1*, which identified parents that performed dietary change interventions after teaching and those who did not perform any intervention. The data management and analysis plan were kept at PCCF institutions by its personnel. Confidentiality was maintained by redacting all of the participants' personal information and identifying them by the subject or screening numbers assigned to them. The validity and reliability of the questionnaire were measured by comparing the nutritional knowledge scores from GNKQ the pre-test and post-test using the variables T0 and T1.

Descriptive statistics served to analyze demographic information, and the four nutrition knowledge domains and total scores guided the compilation, sorting, and tabulation of the written comments. The analysis of the data included calculation of the standard deviations, means, and percentages as Tables 1, 2, and 3 and Figures 1, 2, and 3 show, respectively.

Setting

The project was carried out at the PCCF, a facility located in the Miami area. The participants were parents of pediatric patients who had been diagnosed with diabetes and/or hyperlipidemia.

Project Procedures

The project was conducted over the course of four months. The planning included meeting with the stakeholders and management at the PCCF, performing a risk-benefit analysis, analyzing the background and infrastructure of the PCCF's departments, assessing the availability of the funding to implement the plan and cover the costs, estimating the

implementation costs of the nutritional support intervention, scheduling meetings to determine the feasibility of the design, considering how the data, pamphlets, and education would be delivered to the caregivers, staff members, and others involved, and designing workflows and protocols for collecting and processing the information by the nurses, laboratory workers, and others at the PCCF.

For the collection of the initial data before the delivery of the educational content, the parents whose children had been diagnosed with hyperlipidemia and diabetes at the PCCF received pamphlets. The purpose of these interviews was to gather in-depth insights into the challenges associated with maintaining a healthy diet. Because this was a QI project, the intervention was based on a rapid improvement cycle (specifically, the plan-do-study-act cycle) and took the form of a qualitative evaluation (Patton, 2015; Polit & Beck, 2017). These steps enabled the systematic acquisition and assessment of information relevant to the impact of the intervention in achieving its goals and helped explain the change process.

Second, the parents received the pamphlets and PowerPoint presentations on dietary modifications and lifestyle changes presented in Appendix D, and members of the PCCF emphasized to them the need for change. The education consisted of the administration of guides on basic nutrition topics suitable for parents of children in this age group, including plate portion size, the interpretation of nutritional labels on products, the association between healthy eating and good health, and recommendations for PA.

Third, follow-ups with the parents of the pediatric patients served to evaluate the effectiveness of the intervention by distinguishing the parents who performed the lifestyle modification and dietary change intervention from those who did not. The distinction was made based on the administration of a new set of questionnaires. Also in this phase of the project, the

project team conducted interviews with members of the community who worked with pediatric patients to learn about the resources and support that were available to help the patients manage their diet.

The pursuit of quality outcomes through the implementation of this project required advocacy for the best interests of the pediatric patients and their families at the PCCF by embracing the responsibility for autonomous practice and committing to a collaborative approach to patient care. It was also necessary to pursue, assess, and integrate the best evidence to support the implementation of this project. The use of healthcare technology at the PCCF was pivotal for achieving the outcomes and goals of this project. Another resource offered by the PCCF to its patients that proved helpful in conducting this project was the newly implemented Step Ahead wellness and savings program, which included nutritional counseling, and fitness coaching.

Designing and Testing

As has been seen, the pre- and post-questionnaires using the GNKQ completed by the parents at the PCCF (Appendix A) assessed the nutritional knowledge, nutritional status, and physical status of the pediatric patients for this QI project. The questions assessed the parents' nutritional knowledge, specifically, regarding the lifestyle and nutritional modifications necessary to avoid the risk of chronic conditions such as hyperlipidemia and diabetes in the pediatric population. MyPlate, brochures, and PowerPoint presentations communicated the information about these modifications to parents.

An evaluation of the culture of the PCCF organization was also important to identify clinical problems that could hinder the implementation of this project and features that could contribute to the success of the clinical intervention. The assessment of the PCCF took into

account the organizational leadership, management of employees, and strategic emphases. Other measures taken to bolster the planning of the project involved training the staff, establishing the documentation process, organizing implementation, working out the logistics of the evaluation, evaluating the existing PCCF organizational structure for the features just mentioned, and assessing the PCCF's financial viability, the availability of collaborative resources, and the needs of the pediatric population and their caregivers that would be served.

Ethical Considerations

FIU's Institutional Review Board (IRB) approved this project. The participants were informed orally and in writing about the voluntary nature of participation in this focus group and project, and they provided written informed consent of their permission to use their reports and answers to questions as data for the project. They were also informed that they had the right to withdraw their consent at any time and that the benefits of participation included improvement in their knowledge of lifestyle and nutritional modifications that could help their children avoid the risk of chronic health conditions such as diabetes and hyperlipidemia.

The advocacy for the best interests of the pediatric patients and their families at the PCCF involved embracing the responsibility of autonomous practice and committing to a collaborative approach in patient care. No personal data were collected during this project, and the participants were identified only indirectly. The data were stored in a password-protected online database accessible only to the primary investigator and members of the staff participating in the QI project.

Results

Twelve parents signed the informed consent form and completed the pre-test, but 2 changed their minds about participating and withdrew consent. The remaining participants

included three men and seven women. Seventy percent of the parents described their health as good, 20% reported it as fair, and 10% reported it as very good. Fifty percent reported being married, 30% reported being single, 20% reported living as married, and 10% reported being separated. All of the participants reported not meeting the Nutritional Related Qualifications. Tables 1 and 2 present the total and individual section scores for the pre-test (T0 = 60.00%) and post-test (T1 = 69.55%) using the GNKQ.

The results indicated an improvement in the participants' overall nutritional knowledge after the administration of the nutritional education. The mean overall pre- and post-test values were 57.00 (± 8.85, representing a score of 64.77%), as Table 3 shows. The highest overall individual section score was in SON, 23.50 (± 3.61), representing a score of 90.31%. This section measures everyday sources of nutrients in food and the ability to make healthy food choices. The remaining individual section scores for DR (12.85 ± 2.39), HFC (7.55 ± 2.76), and DDWM (13.10 ± 2.71) demonstrated deficits in nutritional knowledge, being below 72%. These sections measured knowledge of the food groups, suggested serving sizes, sources of nutrients in food, and the correlation between diet and disease, respectively.

Table 1

Total and Individual Section Scores for the Pre-test Based on Gender for the GNKQ

	OverallI (n = 10)			Males (n = 3)			Female (n = 7)		
Topic (max score)	Mean (SD)	Range	%	Mean (SD)	Range	%	Mean (SD)	Range	%
DR (18)	11.9 (2.33)	9-16	66.11	10.0 (1.0)	9-11	55.56	12.71 (2.29)	9-16	70.63
SON (36)	21.7 (3.68)	16-28	60.28	18.0 (1.73)	16-19	50.00	23.29 (3.09)	18-28	64.68
HFC (l3)	7.0 (2.58)	3-11	53.85	6.67 (1.53)	5-8	51.28	7.14 (3.02)	3-11	54.95
IJDWM(2I)	12.2 (2.35)	8-15	58.10	11.0 (2.00)	9-13	52.38	12.71 (2.43)	8-15	60.54
Total Score (88)	52.8 (7.44)	39-61	60.00	45.67 (5.86)	39-51	51.89	55.86 (5.93)	49-66	63.47

T (0) = 60%

Table 2

Total and Individual Section Scores for the Post-test Based on Gender for the GNKQ

	Overall (n = 10)			Males (n = 3)			Female (n = 7)		
Topic (max score)	Mean (SD)	Range	%	Mean (SD)	Range	%	Mean (SD)	Range	%
DR (18)	13.80 (2.15)	9-17	76.67	12.33 (1.0)	9-14	68.52	14.43 (1.62)	13-17	80.16
SON (36)	25.30 (2.58)	21-28	70.28	25.67 (1.73)	21-28	71.30	25.14 (2.12)	22-28	69.84
HFC (l3)	8.10 (2.96)	4-12	62.31	10.33 (1.53)	7-12	79.49	7.14 (2.61)	4-11	54.95
IJDWM(2I)	14.00 (2.87)	8-19	66.67	13.33 (2.00)	8-16	63.49	14.29 (2.21)	13-19	68.03
Total Score (88)	61.20 (8.42)		69.55	61.67 (5.86)		70.08	61.00 (6.06)		69.32

T (1) = 69.55%

Table 3

Total and Individual Section Scores over All Based on Gender for the GNKQ

	Overall (n = 10)			Males (n = 3)			Female (n = 7)		
Topic (max score)	Mean (SD)	Range	%	Mean (SD)	Range	%	Mean (SD)	Range	%
DR (18)	12.85	9-17	71.39	11.0	9-14	68.52	13.57	9-17	75.40
	(2.39)			(2.32)			(2.10)		
SON (36)	23.50	16-28	90.38	21.83	16-28	71.30	24.21	18-28	93.13
	(3.61)			(5.04)			(2.72)		
HFC (l3)	7.55	3-12	58.08	8.50	5-12	79.49	7.14	3-11	54.95
	(2.76)			(2.88)			(2.71)		
IJDWM(2I)	13.10	8-19	62.38	12.17	8-16	63.49	13.50	8-19	64.29
	(2.71)			(3.43)			(2.38)		
Total Score (88)	57.00		64.77	53.67		70.08	58.43		66.40
	(8.85)			(13.19)			(6.35)		

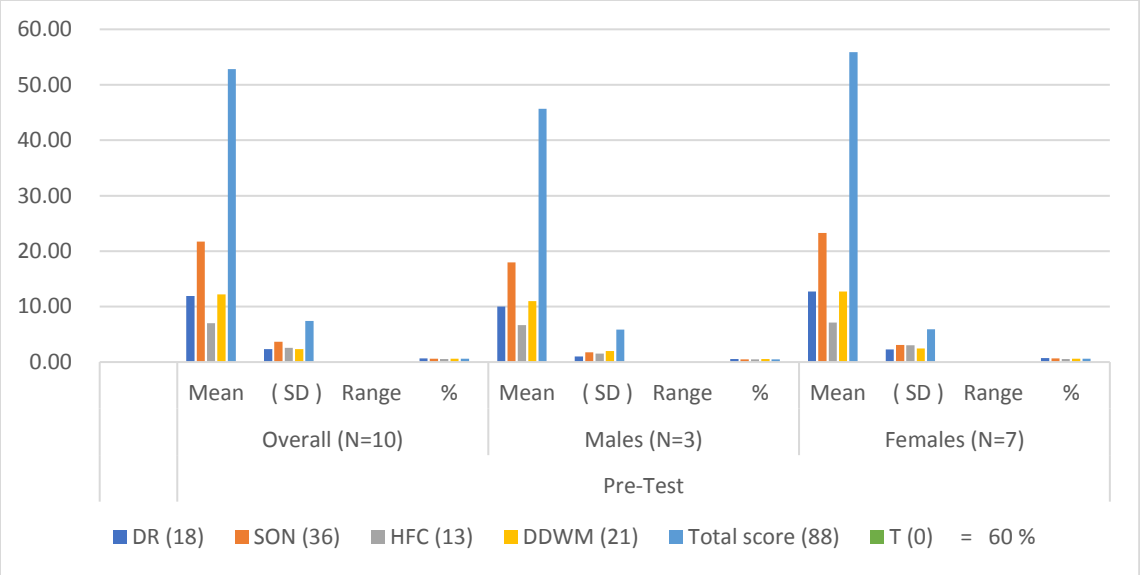

Figure 1. Total and individual section scores for the pre-test based on gender for the GNKQ.

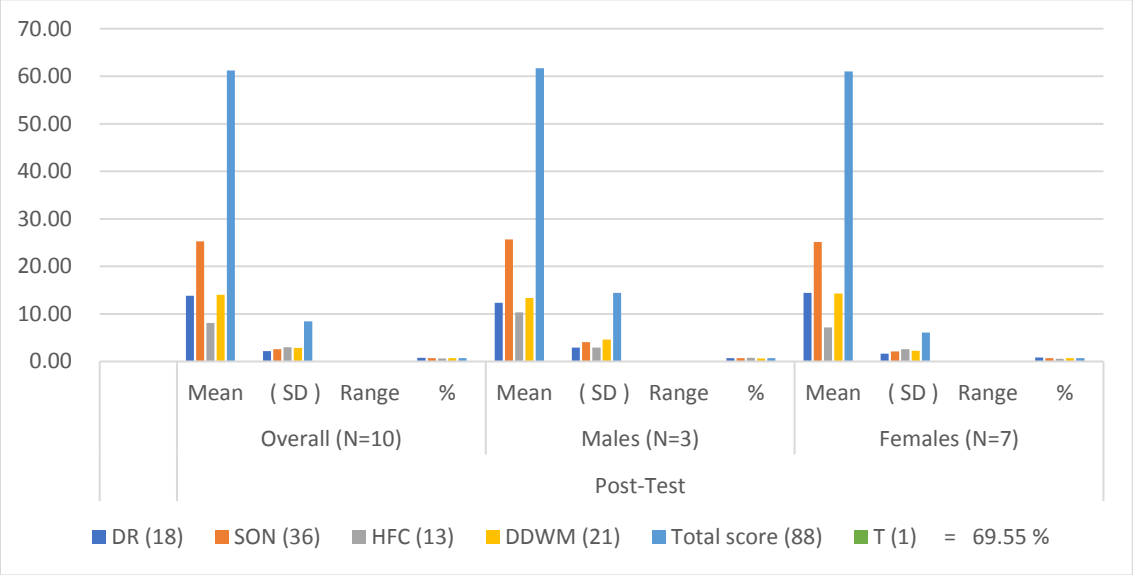

Figure 2. Total and individual section scores for the post-test based on gender for the GNKQ.

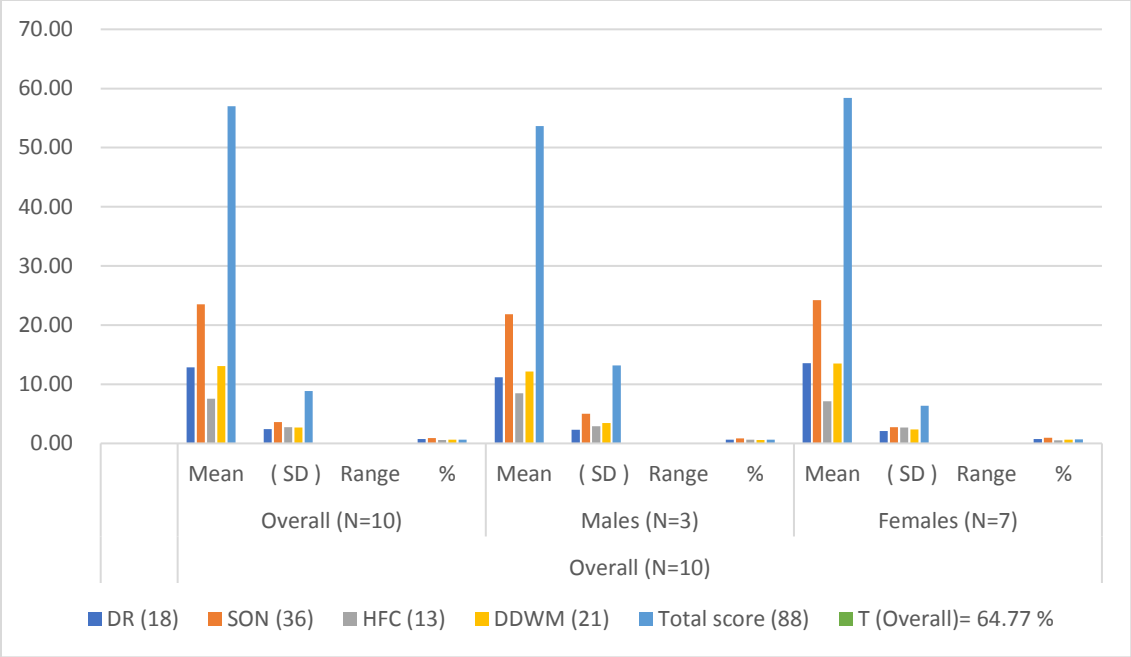

Figure 3. Total and individual section scores over all based on gender for the GNKQ.

Discussion

This project provided preliminary information regarding the nutritional knowledge of the parents of pediatric patients diagnosed with hyperlipidemia and diabetes. While the parents demonstrated an overall accuracy on the GNKQ-R of 70.1%, the domains of DR, SON, and DDWM fell below this threshold. The total and individual section score for the pre-test (T0) was 60% and for the post-test (T1) 69.55%. These results indicated an improvement in the overall nutritional knowledge after the parents received the nutritional education. The mean overall GNKQ score, including the pre- and post-test values, was 57.00 (± 8.85), representing 64.77%. The highest overall individual score was for SON, 23.50 (± 3.61) representing 90.31%.

The strengths of the QI project included the use of a well-validated instrument (i.e., the GNKQ) to evaluate the parents' nutritional knowledge before and after they received the educational intervention regarding nutrition and lifestyle modifications that may help their children avoid developing chronic health conditions. The parents showed a deficit in overall

interest, with scores of 58.08% (of 13 questions) in the domain of HFC and 62.38% (of 21 questions) in the domain of DDWM. These results also suggest that parents may benefit from further increases in nutrition knowledge in the form of links to MyPlate and other educational materials.

The highest mean score for an individual section was for SON, 23.50 (± 3.61), representing 90.31%. This score is considerably higher than those reported in other studies using the GNKQ. Also, the acquisition of procedural nutrition knowledge by the parents may have facilitated their planning, purchasing, and preparation of food at home in ways consistent with the goal of decreasing the risk of chronic conditions such as diabetes and hyperlipidemia. It remains unclear how predictive this acquisition of knowledge will be regarding the actual quantities of healthy food consumed.

Taken together, the results regarding the domains covered in this project from the pre- and post-test suggest that the parents had the ability to make healthy food purchases. However, they may not have understood why certain purchases provide better nutrition than others. The results also suggest that several factors may affect food behavior, including perceived consequences, attitudes and beliefs, skills, confidence, the environment, and behavioral motivators.

Conclusions

The findings presented here indicate that the parents of pediatric patients diagnosed with hyperlipidemia and diabetes who participated in the QI project experienced an improvement in their overall nutritional knowledge as a result of the nutritional education intervention. The domains in the GNKQ served to measure their nutritional knowledge regarding food selection. The improvement in the parents' nutritional knowledge after the intervention at the PCCF is

reflected in the difference between the values calculated for the variables T0 and T1, 60.00% and 69.55%, respectively, and in the increase in the mean overall GNKQ scores from the pre and post-test values for parent participants, which were 57.00 (± 8.85), representing 64.77%, and 00.00 (± 0.00), representing 00.00% (± 0.00).

Limitations of the Project

There were several limitations to this QI project. A major limitation was the small sample size (n = 10) of parents whose children had been diagnosed with hyperlipidemia and diabetes. These participants were recruited from the PCCF based on the medical records at one PCCF office. This method allowed for access to more patients than recruiting participants from multiple PCCF clinics or pediatric practices.

Participation in this QI project was, of course, completely voluntary. The voluntary nature of the project potentially contributed to the small sample size. Notably, the pamphlets distributed for the educational intervention contributed to the parents' acquisition of additional information about healthy nutritional habits; thus, an overload of information might have caused some parents to overlook the information provided. A further limitation was that the participants were all English speakers, a fact that may limit the generalizability of the findings. One more limitation, and one that contributed to the small sample size, was the limited time frame for the project.

Implications for Practice

Though dietary management is a critical component of diabetes and hyperlipidemia care, little is known about the factors that influence the ability of pediatric patients to maintain a healthy diet. This project contributes to the understanding of the challenges that their parents face when trying to do so and offers an assessment of the role of community resources in

supporting dietary management. The findings also provide a basis for recommendations for improving dietary management among pediatric patients so as to prevent chronic conditions such as diabetes and hyperlipidemia by better supporting their efforts to maintain a healthy diet, ultimately leading to better health outcomes.

Dissemination Plan and Sustainability

One of the first steps in disseminating the knowledge acquired from this QI improvement project and sustaining the QI plan is sharing the results with the clinicians and other staff members involved with patient care at the pediatric clinic. The intent is for clinicians and practitioners to have the opportunity to ask questions and express any concerns regarding lifestyle and nutritional modifications that can decrease pediatric patients' risk of developing chronic health conditions such as diabetes and hyperlipidemia and provide feedback. In addition, an abstract will be submitted to the American Association of Nurse Practitioners to be peer-reviewed for the presentation of a paper about the findings at the organization's national conference. Lastly, a manuscript will be prepared for publication in the *Journal of the American Associate of Nurse Practitioners*, which addresses the concerns of nurse practitioners and is dedicated to supporting best practices by advising them about new developments in healthcare. However, publications alone will not be sufficient to translate the evidence presented here into practice. In order to maintain change, future nurse leaders, researchers, and educators must continue refining the process and content of the nutritional education delivered to parents through subsequent QI studies.

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Appendix A

GENERAL NUTRITION KNOWLEDGE QUESTIONNAIRE (NKQ)

This is a survey, not a test. Your answers will help identify which dietary advice people find confusing. It is important that you complete it by yourself. Your answer will remain anonymous. If you don't know the answer, mark "not sure" rather than guess.

Thank you for your time.

Section 1: The first few items are about what advice you think experts are giving us.

1. Do health experts recommend that people should be eating more, the same amount, or less of the following foods? (tick one box per food)

	More	Same	Less	Not Sure
Fruit	☐	☐	☐	☐
Food and drinks with added sugar	☐	☐	☐	☐
Vegetables	☐	☐	☐	☐
Fatty foods	☐	☐	☐	☐
Processed red meat	☐	☐	☐	☐
Wholegrains	☐	☐	☐	☐
Salty foods	☐	☐	☐	☐
Water	☐	☐	☐	☐

2. How many servings of fruit and vegetables per day do experts are advice people to eat as a minimum? (One serving could be, for example, an apple or a handful of chopped carrots) (tick one)

2	☐
3	☐
4	☐
5 or more	☐
Not sure	☐

3. Which of these types of fats do experts recommend that people should eat less of? (tick one box per food)

	Eat less	Not eat less	Not sure
Unsaturated fats	☐	☐	☐
Trans fats	☐	☐	☐
Saturated fats	☐	☐	☐

4. Which types of dairy foods do experts say people should drink? (tick one)

Full fat (e.g. full fat milk)	☐
Reduced fat (e.g. skimmed and semi-skimmed milk)	☐
Mixture of full fat and reduced fat	☐
Neither, dairy foods should be avoided	☐

Not sure ☐

5. How many times per week do experts recommend that people eat oily fish (e.g. salmon and mackerel)? (tick one)

1-2 times per week ☐

3-4 times per week ☐
Every day ☐
Not sure ☐

6. Approximately how many alcoholic drinks is the maximum recommended per day (The exact number depends on the size and strength of the drink)? (tick one)

1 drink each for men and women ☐
2 drinks each for men and women ☐
2 drinks for men and 1 drink for women ☐
3 drinks for men and 2 drinks for women ☐
Not sure ☐

7. How many times per week do experts recommend that people eat breakfast? (tick one)

3 times per week ☐
4 times per week ☐
Every day ☐
Not sure ☐

8. If a person has two glasses of fruit juice in a day, how many of their daily fruit and vegetable servings would this count as? (tick one)

None ☐
One serving ☐
Two servings ☐
Three servings ☐
Not sure ☐

9. According to the 'eatwell plate' (a guideline showing the proportions of food types people should eat to have a balanced and healthy diet), how much of people's diet should be made up of starchy foods? (tick one)

¼ plate ☐
⅓ plate ☐
½ plate ☐
Not sure ☐

Section 2: Experts classify foods into groups. We are interested to see whether people are aware of food groups and the nutrients they contain.

1. Do you think these foods and drinks are typically high or low in added sugar? (tick one box per food)

	High in added sugar	Low in added sugar	Not sure
Diet cola drinks	☐	☐	☐
Natural yoghurt	☐	☐	☐

Ice cream	☐	☐	☐
Tomato ketchup	☐	☐	☐
Melon	☐	☐	☐

2. Do you think these foods are typically high or low in salt? (tick one box per food)x

	High in salt	Low in salt	Not Sure
Breakfast cereals	☐	☐	☐
Frozen vegetables	☐	☐	☐
Bread	☐	☐	☐
Baked beans	☐	☐	☐
Red meat	☐	☐	☐
Canned soup	☐	☐	☐

3. Do you think these foods are typically high or low in fibre? (tick one box per food)

	High in fibre	Low in fibre	Not Sure
Oats	☐	☐	☐
Bananas	☐	☐	☐
White rice	☐	☐	☐
Eggs	☐	☐	☐
Potatoes with skin	☐	☐	☐
Pasta	☐	☐	☐

4. Do you think these foods are a good source of protein? (tick one box per food)

	Good source of protein	Not a good source of protein	Not sure
Poultry	☐	☐	☐
Cheese	☐	☐	☐
Fruit	☐	☐	☐
Baked beans	☐	☐	☐
Butter	☐	☐	☐
Nuts	☐	☐	☐

5. Which of the following foods do experts count as starchy foods? (tick one box per food)

	Starchy food	Not a starchy food	Not sure
Cheese	☐	☐	☐
Pasta	☐	☐	☐
Potatoes	☐	☐	☐
Nuts	☐	☐	☐
Plantains	☐	☐	☐

6. Which is the main type of fat present in each of these foods? (tick one box per food)

	Polyunsaturated fat	Monounsaturated fat	Saturated fat	Cholesterol	Not sure
Olive oil	☐	☐	☐	☐	☐
Butter	☐	☐	☐	☐	☐
Sunflower oil	☐	☐	☐	☐	☐
Eggs	☐	☐	☐	☐	☐

7. Which of these foods has the most trans-fat? (tick one)

Biscuits, cakes and pastries ☐
Fish ☐
Rapeseed oil ☐
Eggs ☐
Not sure ☐

8. The amount of calcium in a glass of whole milk compared to a glass of skimmed milk is: (tick one)

About the same ☐
Much higher ☐
Much lower ☐
Not sure ☐

9. Which one of the following nutrients has the most calories for the same weight of food? (tick one)

Sugar ☐
Starchy ☐
Fibre/roughage ☐
Fat ☐
Not sure ☐

10. Compared to minimally processed foods, processed foods are: (tick one)

Higher in calories ☐
Higher in fibre ☐
Lower in salt ☐
Not sure ☐

Section 3: The next few items are about choosing foods

1. If a person wanted to buy a yogurt at the supermarket, which would have the least sugar/sweetener? (tick one)

0% fat cherry yogurt ☐
Natural yogurt ☐
Creamy fruit yogurt ☐
Not sure ☐

2. If a person wanted a soup in a restaurant or cafe, which one would be the lowest fat option? (tick one)

Mushroom risotto soup (field mushrooms, porcini mushrooms, arborio rice, butter, cream, parsley and cracked black pepper) ☐

Carrot butternut and spice soup (carrot, butternut squash, sweet potato, cumin, red chillies, coriander seeds and lemon) ☐

Cream of chicken soup (British chicken, onions, carrots, celery, potatoes, garlic, sage, wheat flour, double cream) ☐

Not sure ☐

3. Which would be the healthiest and most balanced choice for a main meal in a restaurant? (tick one)

Roast turkey, mashed potatoes and vegetables ☐
Beef, Yorkshire pudding and roast potatoes ☐
Fish and chips served with peas and tartar sauce ☐
Not sure ☐

4. Which would be the healthiest and most balanced sandwich lunch? (tick one)

Ham sandwich + fruit + blueberry muffin + fruit juice ☐
Tuna salad sandwich + fruit + low fat yogurt + water ☐
Egg salad sandwich + crisps + low fat yogurt + water ☐
Not sure ☐

5. Which of these foods would be the healthiest choice for a pudding? (tick one)

Berry sorbet ☐
Apple and blackberry pie ☐
Lemon cheesecake ☐
Carrot cake with cream cheese topping ☐
Not sure ☐

6. Which of these combinations of vegetables in a salad would give the greatest variety of vitamins and antioxidants? (tick one)

Lettuce, green peppers and cabbage ☐
Broccoli, carrot an tomatoes ☐
Red peppers, tomatoes and lettuce ☐
Not sure ☐

7. If a person wanted to reduce the amount of fat in their diet, but didn't want to give up chips, which of the following foods would be the best choice? (tick one)

Thick cut chips ☐
Thin cut chips ☐

Crinkle cut chips ☐
Not sure ☐

8. One healthy way to add flavour to food without adding extra fat or salt is to add: (tick one)

Coconut milk ☐
Herbs ☐
Soya sauce ☐
Not sure ☐

9. Which of the following cooking methods requires fat to be added? (tick one)

Grilling ☐
Steaming ☐
Baking ☐
Sautéing ☐

Not sure ☐

10. Traffic lights are often used on nutrition labelling, what would amber mean for the fat content of a food? (tick one)

Low fat ☐
Medium fat ☐
High in fat ☐
Not sure ☐

11. "Light" foods (or Diet foods) are always good options because they are low in calories. (tick one)

Agree ☐
Disagree ☐
Not sure ☐

The following questions are related to food labels:

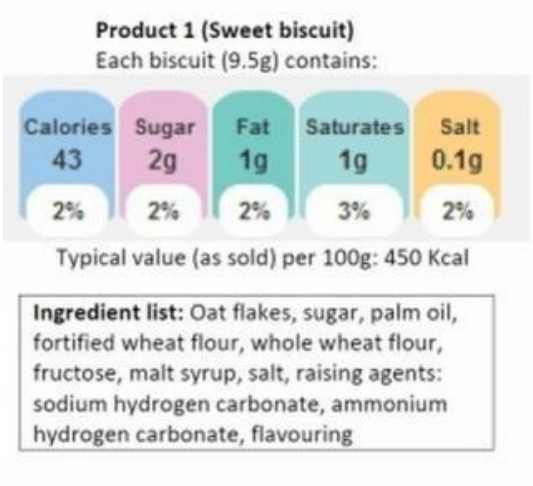
12. Looking at the product 1 and 2, which one has the most calories (kcal) per 100 grams (tick one)

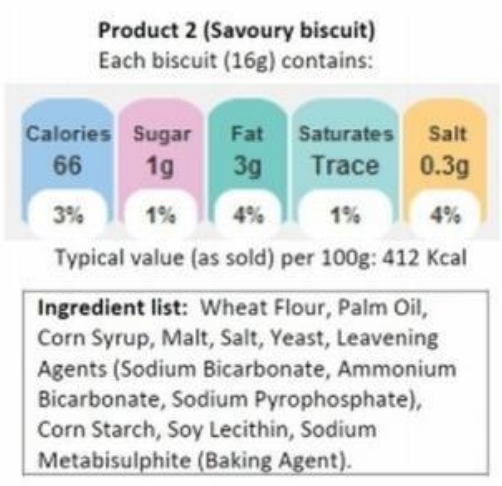
Product 1 ☐
Product 2 ☐
Both have the same quantity ☐
Not sure ☐

13. Looking at the product 1, what are the sources of sugar in the ingredient list? (tick one)

Sugar and malt syrup ☐
Sugar, fructose and lecithin ☐
Sugar, fructose and malt syrup ☐
Not sure ☐

Section 4: This section is about health problems or diseases related to diet and weight management





1. Which of the diseases is related to a low intake of fibre? (tick one)

Bowel disorders ☐
Anaemia ☐
Tooth decay ☐
Not sure ☐

2. Which of these diseases is related to how much sugar people eat? (tick one)

High blood pressure ☐
Tooth decay ☐
Anaemia ☐
Not sure ☐

3. Which of the diseases is related to how much salt (or sodium) people eat? (tick one)

Hypothyroidism ☐
Diabetes ☐
High blood pressure ☐
Not sure ☐

4. Which of these options do experts recommend to reduce the chances of getting cancer? (tick one)

Drinking alcohol regularly ☐
Eating less red meat ☐
Avoiding additives in food ☐
Not sure ☐

5. Which of these options do experts recommend to prevent heart disease? (tick one)

Taking nutritional supplements ☐
Eating less oily fish ☐
Eating less trans-fats ☐
Not sure ☐

6. Which of these options do experts recommend to prevent diabetes? (tick one)

Eating less refined foods ☐
Drinking more fruit juice ☐
Eating more processed meat ☐
Not sure ☐

7. Which one of these foods is more likely to raise people's blood cholesterol? (tick one)

Eggs ☐
Vegetable oils ☐
Animal fat ☐

Not sure ☐

8. Which one of these foods is classified as having a high Glycaemic Index (Glycaemic Index is a measure of the impact of a food on blood sugar levels, thus a high Glycaemic Index means a greater rise in blood sugar after eating)? (tick one)

Wholegrain cereals ☐
white bread ☐
Fruit and vegetables ☐
Not sure ☐

9. To maintain a healthy weight people should cut fat out completely. (tick one)

Agree ☐
Disagree ☐
Not sure ☐

10. To maintain a healthy weight people should eat a high protein diet. (tick one)

Agree ☐
Disagree ☐
Not sure ☐

11. Eating bread always causes weight gain. (tick one)

Agree ☐
Disagree ☐
Not Sure ☐

12. Fibre can decrease the chances of gaining weight. (tick one)

Agree ☐
Disagree ☐
Not sure ☐

13. What of these options can help people to maintain a healthy weight? (answer each one)

	Yes	No	Not sure
Not eating while watching TV	☐	☐	☐
Reading food labels	☐	☐	☐
Taking nutritional supplements	☐	☐	☐
Monitoring their eating	☐	☐	☐
Monitoring their weight	☐	☐	☐
Grazing throughout the day	☐	☐	☐

14. If someone has a Body Mass Index (BMI) of 23kg/m^2, what would their weight status be? (tick one)

Underweight	☐
Normal weight	☐
Overweight	☐
Obese	☐
Not sure	☐

15. If someone has a Body Mass Index (BMI) of 31kg/m^2, what would their weight status be? (tick one)

Underweight	☐
Normal weight	☐
Overweight	☐
Obese	☐
Not sure	☐

Look at the body shape below:

16. Which of these body shapes increases the risk of cardiovascular disease (Cardiovascular disease is a general term that describes a disease of the heart of blood vessels, for example, angina, heart attack, heart failure, congenital heart disease and stroke)? (tick one)

Apple shape	☐
Pear shape	☐
Not sure	☐

Section 5: We would like to ask you a few questions about yourself

1. Are you…

Male	☐
Female	☐

2. What is your current weight approximately? Please give this in stones and pounds or kilograms.

Stones	
Pounds	
Or Kilograms	

3. What is your current height approximately? Please give this in feet and inches or centimetres.

Feet	
Inches	
Centimetres	

4. In general, would you say your health is…

Poor ☐
Fair ☐
Good ☐
Very good ☐
Excellent ☐

5. Are you

Single ☐
Married ☐
Living as married ☐
Separated ☐
Divorced ☐
Widowed ☐

6. Do you have any children?

No ☐
1 ☐
2 ☐
3 ☐
4 ☐
More than 4 ☐

7. Do you have any children, under 18 years, living with you?

Yes ☐
No ☐

8. What best describe your ethnic origin? (Tick one)

White British ☐
White Irish ☐
Other White background ☐
Black British ☐
Black Caribbean ☐
Black African ☐
Other Black background ☐
Indian ☐
Pakistani ☐
Bangladeshi ☐
Chinese ☐
Other Asian background ☐
White and Black Caribbean ☐
White and Black African ☐

White and Asian ☐
Other mixed background ☐
Other, please specify:

9. What is the highest level of education you have completed?
Primary school ☐
Secondary school ☐
O level/ GSCEs ☐
A levels ☐
Technical or trade certificate ☐
Diploma ☐
Degree ☐
Post-graduate degree ☐

10. What is your educational qualification?

11. Do you have any nutrition related qualifications (or are you studying to get a nutrition qualification)?
Yes ☐
No ☐
Please specify:

Thank you very much for taking part in this survey!

Appendix B

Table 4

Summarized Literature Review

Nutritional and Lifestyle Interventions						
Author/year	**Design**	**Sample/setting**	**Topic studied**	**Key findings**	**Misc. note**	**John Hopkins Appraisal Tool**
• Alvarez-Alvarez et al. (2020)	• R.C.T	• From October 2013 to December 2016 throughout 23 Spanish Centers, a total of 6,874 participants were recruited.	• Identified minor relationships between the highest adherence to high-quality dietary indices (HQDI), particularly Mediterranean-style and Prime Diet Quality Scores (PDQS), and the lower prevalence of individual and clustered	• Summarized the highest adherence to dietary quality indexes, especially Mediterranean-style and PDQS scores. • Highest consistency to any dietary pattern did not exhibit inverse relationships with hypertension. • The modified Mediterranean Diet Score, Mediterranean Diet Adherence Score, the pro-vegetarian dietary pattern and the Alternate Healthy Eating Index were inversely associated with prevalence of obesity. • Significant inverse trend among participants in this RCT who better adhered to the MEDAS and the PDQS in the mean number of	• The prevalence of four cardiovascular risk factors (CVRFs), such as hypertension, obesity, diabetes, and dyslipidemia, using standard diagnoses criteria in the study, were considered as outcomes	• **Level I Grade A**

			among senior persons and pediatric patients with metabolic syndrome and an increased risk of cardiovascular disease.	CVRF across categories of adherence. • Lastly, better adherence to several HQDI was associated with improved blood lipid profiles and anthropometric measures.		
• Chauhan, A. & Paunikar, P. (2014)	• Peer Opinion	• None	• Serum lipid TC, HDL, LDL) levels and diet management.	• Serum lipid levels improved among children and adolescents between the ages of 6 and 19 between 1988 and 1994 and 2007 and 2010. • The average level of TC dropped from 165 to 160 mg/dl, while the incidence of high TC dropped from 11.3 to 8.1%. • The percentage of 9-11-year-olds with low HDL-C or high non-HDL-C rose from 2007 to 2010 and averaged around 20%.	• In accordance with NHBLI standards, this requires further investigation.	• **Level V Grade A**

• Dagnew et al. (2021)	• Systematic review and meta-analysis	• The hypertriglyceridemia meta-analysis included 18 main studies with a total of 4961 people who have diabetes.	• Dyslipidemia is one of the leading causes of cardiovascular complications in DM patients.	• Dyslipidemia is one of the leading causes of cardiovascular complications in DM patients. • Despite it is a major public health problem in undeveloped and developed countries worldwide, there is no a nation-wide study to determine dyslipidemia among DM patients yet. • Estimate the prevalence of hypertriglyceridemia and other plasma lipid abnormalities among people living with DM , emphasizing that prevalence of hypertriglyceridemia and other lipid abnormalities among DM patients, is high in these countries.	• Patients with DM often suffered from dyslipidemia, which increased the risk of cardiovascular problems. • This finding provides more evidence of the critical need for a strict commitment to DM' diet in preventing alterations to the circulatory lipid profile and its associated consequences.	• **Level I Grade A**
• Durbin (2018)	• Systematic Review	• 1st: Obese eight-to ten-year-old boys. • 2nd: CS study on the correlation between PA and sedentary behavior and	• Childhood obesity mitigated by encouraging active play and healthy eating. • Walking program on the	• Reduction in obesity was achieved when adequate PA and balanced meals were included during childhood. • Incorporating the findings of EBP into practice can promote health and	• Use of BMI to measure obesity may be a limitation. • BMI measures excess body weight indirectly; however, it does not measure excess body fat. • The relationship	• **Level I Grade A**

		BMI and obesity rates among 6,539 children between nine and eleven years of age; • 3rd an RCT study on the effects of a walking program on the BMI of children ages six to eleven years; • 4th an SR on the effectiveness of school-based dietary behavior and PA in children and adolescents ages six to eighteen years.	BMI. • Effectiveness of school-based dietary behavior and PA in children and adolescents	wellness in pediatric populations, thus reducing unnecessary healthcare costs attributed to obesity.	between BMI and body fat can be affected by age, sex, ethnicity, muscle mass, fat, or fat-free mass.	
• Hermans (2020)	• Systematic review	• No reported	• Diabetes self-management. • Education, glycemic control. • Mental health.	• Necessity to shift the focus of diabetes education from ensuring patients' compliance to increasing their knowledge. • Encourage independence and self-management. • Diabetes self-management education	• Terms such as "diabetes education" and "diabetes self-management education (DSME)" may be used. • DSME and the meanings of the terms can also differ throughout the included studies. • The quality appraisal of all studies contained	• **Level I Grade A**

				and continuous assistance can be greatly aided by the use of digital solutions.	in these meta-analyses would have been outside the context of a narrative review. • Based on the I^2 statistic as a measure of heterogeneity and the number of contained RCTs, the effect estimates seem to consistently suggest the efficacy of DSME.	
• Marrero et al. (2021)	• RCT	• Majority-Hispanic, of whom at least one-third will prefer to participate in Spanish-only groups. • 60 mothers and their children, who were recruited and randomized to either the intervention or to the wait-listed control group at one of the two FQHC locations	• Prevention of T2DM. • Excess body weight (primary outcome). • Hemoglobin A1c, blood pressure, and changes in lifestyle behaviors	• Reduction in excess body weight (primary outcome), hemoglobin A1c, blood pressure, and changes in lifestyle behaviors associated with weight trajectory and T2DM risk. • Successful completion of this intervention program, will yield a scalable program with high possibilities for replication and dissemination. • In addition, the study estimated the effects of the intervention in notifying families who use the FQHC system about T2DM prevention efforts. • The results from this study will be crucial in creating	• Interventions, were not optimized for dissemination in large-volume primary care settings. • Moreover, Marrero et al. (2021) confirmed that very few programs have simultaneously targeted mothers at risk for T2DM and their children.	• **Level I Grade A**

				a T2DM prevention prototype that can be applied and scaled across FQHCs serving populations affected by T2DM.		
• Pugh et al. (2021)	• Systematic Review	• Coleman et al. (2010) 62 Hispanic children and 82 Hispanic parents enrolled in the program. • Shroff et al. (2012) consisted of 42 children that were enrolled in the study, of which 20 in each arm completed the study. • Stapleton et al. (2001) used 42 children and 55 caregivers in the study. • Niggemann et al. (2001) used, as a sample, 73 infants who were enrolled in the study. • Ball et al. (2005) used parents of	• The role of education. • The role of parents/caregivers. • The role of self-management. • The identification of enablers and barriers to dietary change.	• From the review emerged four themes related to early dietary change: ○ The role of education. ○ Parents'/caregivers' roles. ○ The role of self-management. ○ The identification of enablers and barriers to dietary change.	• Acquiring the perceptions of children, parents, and other stakeholders on factors affecting early dietary change is a key to the self-management of childhood chronic disease.	• **Level I Grade A**

		505 chronically ill children .				
• Sawicki et al.(2019)	• Pilot Study	• Interviewed state and local government agency leaders. • 21 ECE centers for a site visit	• Minor and major facilitators and impediments to the implementation of childhood obesity prevention regulations in ECE settings.	• Inclusion of seven domains and 39 factors in the menu. which are influential for the execution of ECE regulations. • Identified seven facilitating (four major and three minor) and two impeding (major) ones: o Buy-in from parents/caregivers. o Training and communication provided by governing authority and their contractors. o Minimal change needed by the regulations themselves. • Major impeding factors identified were the timing of implementation and the balancing of the demands of the regulations against other priorities.	• These include the broadness of the factors. • The menu application could cause the loss of some of the distinctions of the process of implementation. • Convenience sample employed and evaluated a single policy from a single state, influencing the number and type of factors associated with the menu and their relative.	• **Level IV Grade A**
• Shah et al. (2017)	• Cross-Sectional Study	• 2013 prevalence data for not meeting guidelines for 2012.	• Population-attributable risk percentage for T2DM.	• The cost of T2DM in the U.S. in 2012 related to not following PA guidelines was estimated to be $18.3 billion. • The relation to PI was projected to be $4.65	• From 1990 to 2000, the levels of LTPA continued to be stable or only improved slightly. • During the same period there was a decrease in work-	• **Level IV Grade A**

				billion. • Based on the sensitivity analyses, the estimates varied from $10.19 billion to $27.43 billion for not meeting PA guidelines and $2.59 billion to $6.98 billion for PI in the year 2012. • Billions of dollars could be saved annually just in terms of T2DM cost in the U.S. if the entire population met PA guidelines. • PA support, especially at the environmental and policy levels, should be a primacy in the population.	related, transportation, household activities and a rise in the inactive activity.	
• Yeung et al. (2021)	• Systematic Review	• No reported	• Reductions in total cholesterol and systolic and diastolic BP after adopted the Dietary Approaches to Stop Hypertension (DASH) diet. • Types of dyslipidemia that are frequently encountered in infancy and	• Importance of screening for ASCVD which may start in childhood. • Genetic testing permits enhanced awareness of dyslipidemia and more focus on intervention. • Pharmacologic treatment for pediatric patients, who have been diagnosed with dyslipidemia, has a good safety profile and can decrease adult ASCVD risk.	• Nutritional strategies like the DASH diet had been shown to reduce the risk of cardiovascular disease.	• **Level I Grade C**

			adolescence, with an emphasis on screening, diagnosis, and management			
• Hajhashemy et al. (2022)	• Systematic Reviews and Meta-Analyses	• Combining estimates from 11 studies (including 33,304 subjects).	• People who consumed the highest levels of Ca as part of their diet had lower levels of TGs, bad cholesterol (LDL-C), and good cholesterol (HDL-C)	• People with the highest dietary Ca intake might have lower blood TG, LDL-c, and higher HDL-c concentrations. • The connection between Ca consumption and hyperlipidemia was not substantial.	• Only a few integrated studies have individually informed dietary, supplemental, plant-based, and animal-based Ca consumption. • Other studies did not take into consideration the influence of confounders. • Concentrations of Ca intake were not the same. • Limitations could enhance between-study heterogeneity, which was not totally removed, even after meta-regression analyses. • There was not sufficient data for linear and non-linear dose-response analysis.	• **Level I Grade A**
• Chiavaroli et al. (2018)	• Systematic review and Meta-Analysis	• 439 participants with hyperlipidemia in seven trials.	• The PNP and the NCEP Step-II diet. • Outcome of	• Eligibility criteria were met by seven trial evaluations in 439 participants with hyperlipidemia.	• Irrelevant consequences of the PNP on these outcomes could not be ruled out,	• **Level I Grade A**

	of RCT		LDL-C, non-HDL-C, apolipoprotein B (apo B), TC, TG, systolic and diastolic BP, and C-reactive protein.	• The blend of a PNP and NCEP Step II diet meaningfully decreased the LDL-C by 17%, as well as non-HDL-C, apo B, TC, TG, systolic and diastolic BP, C-reactive protein, and estimated 10-year CHD risk. • There was no effect on HDL-C or body weight.	• There was any biological motive to suppose that the PNP would perform differently in people with diabetes. • Discrepancy in the treatment effects among the trials for LDL-C, TC, TG, non-HDL-C, apo B, and 10-year CHD risk.	
• Shaw et al. (2014)	• Systematic review and Meta-Analysis	• 2954 studies, and 18 were included using registered nurses (RN) or equivalents as a sample of people who titrated medications.	• Outpatient management of persons with chronic conditions, such as diabetes, hypertension, and hyperlipidemia will benefit from a combined-team strategy that makes use of nurse-managed protocols.	• Team approach that used RNs as nurse-managed protocols. • Outpatient management of persons with chronic conditions, such as diabetes, hypertension, and hyperlipidemia. • HbA1c level was reduced by 0.4%, and the systolic and diastolic BP decreased by 3.68 mm Hg. • TC level was reduced by 0.24 mmol/L (9.37 mg/dL), and the LDL-C decreased by 0.31 mmol/L.	• Limited descriptions of the interventions and protocols used..	• **Level I Grade A**
• Tan et al. (2019)	• Systematic review and Meta-analysis	• 940 total participants	• Improving health knowledge education increases drug adherence.	• Low- to moderate-intensity exercise significantly decreased systolic BP and increased HDL values.	• Successive subgroup analysis showed no noticeable change in systolic BP readings. There weren't enough studies to compare HDL and HbA1C	• **Level I Grade A**

					values.	
• Polonsky et al. (2020)	• Retrospective Study	• 209 patients were seen in this 27-month period.	• Variety of lipid abnormalities that primary care physicians identify and reference after cholesterol screening.	• The diversity of lipid abnormalities that are discovered and referred to by primary care physicians after cholesterol screening. • Recommended the efficacy of current dietary therapy in patients with elevated LDL-C.	• No consistent dietary surveys were accessible documenting the subjects' previous diet or subsequent compliance. • Results are not valid if the improvements seen in lipid values were entirely due to dietary changes or to some other factor. • TC and LDL-C levels have been noted to decrease with puberty, which could possibly confuse some of our patients' enhancement in these lipid values.	• **Level I Grade A**
• Modesti et al. (2016),	• Meta-analysis of RCT.	• Asian people	• Lifestyle modifications are very successful in preventing new T2DM • Strategy focused on the community rather than the individual, might be more beneficial when dealing with	• RCT's interventions on lifestyle are highly effective in the Asian population. • When ethnic minority groups need to be addressed, approaches directed to the community, instead of to individuals, might be more efficient.	• Limited to published RCTs, excluding observational studies and additional unpublished literature. • Only one RCT study included in the meta-analysis registered Asian subjects living in Europe. • Additional research is needed to better detect effective interventions for the prevention of T2DM in Asian	• **Level I Grade B**

			ethnic minority populations.		minorities residing in Europe. • Were not included subjects from America or Africa; therefore, it limited the generalizability to only African or other populations	
• Sikand et al. (2018)	• Systematic Review and Meta-Analysis	• 34 primary studies, which involved 5,704 participants.	• Multiple one-on-one sessions resulted in appreciable advancements in lipid profile, BMI, glycemic status, and BP.	• MNT interventions lowered LDH-C, TG, fasting blood glucose, HbA1C values, and BMI compared to the control group. Sikand et al. (2018) highlighted that the cost-effectiveness and economic savings of MNT for dyslipidemia demonstrated superior quality-adjusted life years and cost savings from reduced medication use (Sikand et al., 2018). Lastly, EBP from this systematic review and meta-analysis has shown that multiple MNT sessions by an RDN are clinically effective, bringing cost benefits in patients with dyslipidemia and cardiometabolic risk factors.	• Was not measure all lipid and cardiometabolic outcomes. • The number of MNT sessions and the time consumed in MNT with a registered dietitian nutritionist (RDN) were not regularly reported. • The subjects enrolled in each study, varied in age, gender, and type of CVD risk factors. • There were differences in participants' characteristics in each study, as well as variations in interventions, including type, length, setting, intervention configuration, and delivery methods, which could have added to moderate heterogeneity statistics	• **Level I Grade A**

					for some outcomes. • The behavioral interventions were reported as complex; hence, there is a greater chance of intervention inconsistency between the included studies.	
• Ayele et al. (2022)	• Multilevel analysis	• 192,132 participants under five years old	•	• Childhood obesity is becoming a great challenge and a double burden in developing nations. • In SSA Africa, one in twenty kids under five years old was overweight and/or obese. • Male participants under five years old, born to educated mothers, as well as older children and living in the South Africa region were at higher risk for acquiring overweight and/or obesity. • SSA countries should apply early interventions to pause these consequences and prevent the double burden of undernutrition.	• Study was performed based on a nationally representative, multi-country dataset that could enhance the generalizability across the region. Therefore, monitoring the dependency of the data using multilevel analysis would give unbiased effect-size estimates.	• **Level V Grade A**

Appendix C

Individualized Score by Subject

Table 5
Total and Individual Section Scores by Parent 001 for the GNKQ

	Parent 001	
Topic (max score)	Pre-Test	Post-Test
DR (18)	11	14
SON (36)	19	28
HFC (l3)	7	12
IJDWM(2I)	11	16
Total Score (88)	48	70

Table 6
Demographic Parent 001

Demographic Parent 001		
Gender		M
Age		56
Height	Centimeters	176
	Feet	
Weight	Kilograms	84
	Pounds	
Health Status		Good
Marital Status		Married
Children		3
Under 18 living with parents		Yes
Ethnicity		Other Mixed Background
Highest Level of Education Completed		Degree
Nutritional Related Qualifications		No

Table 7

Total and Individual Section Scores by Parent 002 for the GNKQ

	Parent 002	
Topic (max score)	Pre-Test	Post-Test
DR (18)	9	15
SON (36)	24	26
HFC (l3)	9	6
IJDWM(2I)	15	19
Total Score (88)	57	66

Table 8

Demographic Parent 002

Demographic Parent 002		
Gender		F
Age		40
Height	Centimeters	
	Feet	4.11
Weight	Kilograms	
	Pounds	115.6
Health Status		Good
Marital Status		Married
Children		3
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Technical or trade Certificate
Nutritional Related Qualifications		No

Table 9
Total and Individual Section Scores by Parent 003 for the GNKQ

	Parent 003	
Topic (max score)	Pre-Test	Post-Test
DR (18)	13	13
SON (36)	22	23
HFC (l3)	3	4
IJDWM(2I)	14	13
Total Score (88)	52	53

Table 10
Demographic Parent 003

Demographic Parent 003		
Gender		F
Age		37
Height	Centimeters	
	Feet	5.2
Weight	Kilograms	58
	Pounds	130
Health Status		Good
Marital Status		Married
Children		2
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Degree
Nutritional Related Qualifications		No

Table 11
Total and individual section scores by Parent 004 for the GNKQ

	Parent 004	
Topic (max score)	Pre-Test	Post-Test
DR (18)	14	13
SON (36)	24	25
HFC (l3)	4	5
IJDWM(2I)	12	13
Total Score (88)	54	56

Table 12
Demographic Parent 004

Demographic Parent 004		
Gender		F
Age		28
Height	Centimeters	
	Feet	5.2
Weight	Kilograms	
	Pounds	156
Health Status		Good
Marital Status		Married
Children		2
Under 18 living with parents		Yes
Ethnicity		Other Mixed Background
Highest Level of Education Completed		Post Graduate Degree
Nutritional Related Qualifications		No

Table 13
Total and Individual Section Scores by Parent 005 for the GNKQ

	Parent 005	
Topic (max score)	Pre-Test	Post-Test
DR (18)	16	16
SON (36)	22	22
HFC (l3)	6	6
IJDWM(2I)	8	13
Total Score (88)	52	57

Table 14
Demographic Parent 005

Demographic Parent 005		
Gender		F
Age		31
Height	Centimeters	
	Feet	5.5
Weight	Kilograms	
	Pounds	170
Health Status		Fair
Marital Status		Single
Children		2
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Post Graduate Degree
Nutritional Related Qualifications		No

Table 15
Total and individual section scores by Parent 006 for the GNKQ

	Parent 006	
Topic (max score)	Pre-Test	Post-Test
DR (18)	11	13
SON (36)	25	28
HFC (l3)	10	10
IJDWM(2I)	15	15
Total Score (88)	61	66

Table 16
Demographic Parent 006

Demographic Parent 006		
Gender		F
Age		33
Height	Centimeters	
	Feet	5.3
Weight	Kilograms	
	Pounds	150
Health Status		Fair
Marital Status		Living as Married
Children		2
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Degree
Nutritional Related Qualifications		No

Table 17
Total and Individual Section Scores by Parent 007 for the GNKQ

	Parent 007	
Topic (max score)	Pre-Test	Post-Test
DR (18)	14	17
SON (36)	28	27
HFC (l3)	11	11
IJDWM(2I)	13	14
Total Score (88)	66	69

Table 18
Demographic Parent 007

Demographic Parent 007		
Gender		F
Age		33
Height	Centimeters	
	Feet	5.2
Weight	Kilograms	
	Pounds	
Health Status		Good
Marital Status		Single
Children		1
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Post Graduate Degree
Nutritional Related Qualifications		No

Table 19
Total and Individual section Scores by Parent 008 for the GNKQ

	Parent 008	
Topic (max score)	Pre-Test	Post-Test
DR (18)	9	9
SON (36)	16	21
HFC (l3)	5	7
IJDWM(2I)	9	8
Total Score (88)	39	45

Table 20
Demographic Parent 008

Demographic Parent 008		
Gender		M
Age		35
Height	Centimeters	
	Feet	6.4
Weight	Kilograms	
	Pounds	220
Health Status		Very Good
Marital Status		Separated
Children		2
Under 18 living with parents		Yes
Ethnicity		Indian
Highest Level of Education Completed		A level
Nutritional Related Qualifications		No

Table 21
Total and Individual Section Scores by Parent 009 for the GNKQ

	Parent 009	
Topic (max score)	Pre-Test	Post-Test
DR (18)	12	14
SON (36)	18	25
HFC (l3)	7	8
IJDWM(2I)	12	13
Total Score (88)	49	60

Table 22
Demographic Parent 009

Demographic Parent 009		
Gender		F
Age		34
Height	Centimeters	
	Feet	5.7
Weight	Kilograms	
	Pounds	140
Health Status		Good
Marital Status		Living as Married
Children		2
Under 18 living with parents		Yes
Ethnicity		Other White Background
Highest Level of Education Completed		Technical or trade Certificate
Nutritional Related Qualifications		No

Table 23
Total and Individual Section Scores by Parent 010 for the GNKQ

	Parent 010	
Topic (max score)	Pre-Test	Post-Test
DR (18)	10	14
SON (36)	19	28
HFC (l3)	8	12
IJDWM(2I)	13	16
Total Score (88)	50	70

Table 24. Demographic Parent 010

Demographic Parent 010		
Gender		M
Age		45
Height	Centimeters	176
	Feet	
Weight	Kilograms	90
	Pounds	
Health Status		Good
Marital Status		Single
Children		2
Under 18 living with parents		No
Ethnicity		Other White Background
Highest Level of Education Completed		Degree
Nutritional Related Qualifications		No

Appendix D: IRB Approval Letter

FIU | Research & Economic Development
FLORIDA INTERNATIONAL UNIVERSITY

MEMORANDUM

To: Dr. Charles Buscemi

CC: Jorge Luis Valdes

From: Carrie Bassols, BA, IRB Coordinator

Date: February 23, 2023

Proposal Title: "Improving knowledge of parents in dietary management of children with diabetes and hyperlipidemia: A Quality Improvement Project"

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

IRB Protocol Exemption #:	IRB-23-0062	**IRB Exemption Date:**	02/23/23
TOPAZ Reference #:	112692		

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
1) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

Special Conditions: N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

Appendix E

Inform Consent

FIU | FLORIDA INTERNATIONAL UNIVERSITY

CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

PURPOSE OF THE PROJECT

You are being asked to participate in a quality improvement project. The goal of this project is to implement an educational program in the pediatric population, and which is directed at parents in these communities to address dietary management and preventing chronic conditions such as hyperlipidemia, which is the abnormally higher level of any or all lipids or lipoproteins in the blood, and diabetes which is a group of metabolic disorders that includes a high blood sugar level (hyperglycemia) over a prolonged period.

NUMBER OF PROJECT PARTICIPANTS

If you decide to be in this project, you will be one of the participant whose son /daughter has been diagnosed with hyperlipidemia or diabetes at a Primary & Community Care Facility (PCCF) and will benefit of the educational intervention offered by this center aimed to reduce the risk of this chronic conditions such as hyperlipidemia and diabetes.

DURATION OF THE PROJECT

Your participation will be required for at least 4 months, period of time needed to evaluate if dietary managements' educational interventions offered to you, have influenced in decreasing the risk of development of this chronic condition such as hyperlipidemia and diabetes.

PROCEDURES

If you agree to be in the project, we will ask you to do the following things:

1. At your first session, you will complete a questionnaire, which includes general information about your son /daughter and yourself as parent / legal guardian such as age, gender, ethnicity, among others. In addition, the questionnaire will collect initial information / baseline about your current knowledge on dietary management and life style modifications at home to avoid chronic conditions such as hyperlipidemia and diabetes in your son / daughter.
2. You will receive instructions and education through Power point Presentations and pamphlets on how to improve dietary management and life style modifications aimed at decreasing the risk of development of these chronic conditions as hyperlipidemia and diabetes.
3. Within four months, including initial visit or follow ups, and after your instructions and education intervention, you will be measured your knowledge and the skills acquired after education offered on lifestyle modifications and dietary management to decrease the risk of development of these chronic conditions. At this moment, we will reinforce your understanding on how to implement lifestyle modifications and diet aimed to decrease the risk of developing this chronic conditions such as hyperlipidemia and diabetes.

RISKS AND/OR DISCOMFORTS

There are no foreseeable risks with you for participating in this project.

BENEFITS

The following benefits may be associated with your participation in this project: An increase in knowledge on life style modifications and diet, which will help you to better to decrease the risk of developing chronic conditions such as hyperlipidemia and diabetes.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this project. However, if you like to receive the educational material given to the participants in this project, it will be provided to you at no cost

CONFIDENTIALITY
The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

COMPENSATION & COSTS
There is no cost or payment to you for receiving the health education and/or participating in this project.

RIGHT TO DECLINE OR WITHDRAW
Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

RESEARCHER CONTACT INFORMATION
If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Dr. Maria Perez MD at (305) 820-4101, maria.perez@caremax.com or Dr. Charles Buscemi at 305-348-4870, cbuscemi@fiu.edu.

IRB CONTACT INFORMATION
If you would like to talk with someone about your rights of being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu.

PARTICIPANT AGREEMENT
I have read the information in this consent form and agree to participate in this project. I have had a chance to ask any questions I have about this project, and they have been answered for me. I understand that I will be given a copy of this form for my records.
SIGNATURE
I have been given a copy of all four (4) pages of this form.
I have reviewed the information and have had my questions answered.
I agree to take part in this study.

_____ _____ _____
Printed Name Parent / Guardian / Participant Date

_____ _____ _____
Parent / Guardian / Participant Signature Date

_____ _____ _____
Printed Name of Pediatrician / or designee obtaining consent Date

_____ _____
Signature of Person Obtaining Consent Date

Appendix F

LOS Maria Perez MD

CareMax

Date: 02/08/2023

Charles P. Buscemi, PhD,

APRN Clinical Associate

Professor

Nicole Wertheim College of Nursing & Health

Sciences Florida International University

Dear Dr. Buscemi,

Thank you for inviting CareMax to participate in the Doctor of Nursing Practice (DNP) Project of Jorge L Valdes. I understand that this student, guided by me the DNP mentor, will be conducting this project as part of the requirements for the DNP program at Florida International University (FIU). After reviewing the project's proposal titled *"Improving knowledge of parents in dietary management of children with diabetes and hyperlipidemia: A Quality Improvement Project.*" I have warranted him permission to conduct the project in this clinic.

We understand that the project will be developed in our setting and will occur in one session, and probably be implemented afterward. We are also aware of our staff participation in supporting the student to complete this project, including grant the student access to our facilities, give consent, deliver the pre-test questionnaire, provide the educational intervention and the posttest questionnaire to the recruited participants. We will provide a peaceful and safe environment to safeguard our participants' privacy and adequate area to conduct the educational activity.

This project intends to initiate an educational program at CareMax directed at parents and adolescents in these communities to address community dietary management and prevent chronic conditions such as hyperlipidemia and diabetes, including obesity, in the pediatric population.
Before implementing this project, the Florida International University Institutional Review Board will evaluate and approve the procedures to conduct the project.

5378 West 16th Avenue, Hialeah, FL 33012
Telephone: (305) 820-4101, Fax: (305) 821-5698
httQs://www.caremax.com/

CareMax

Education will be provided through pamphlets and power point presentations which will be distributed and presented to parents on teaching about dietary modifications and lifestyle changes. There will be interactions with parents and patients to emphasize the need for change. Teaching will also consist in administration of guides on basic nutrition topics suitable for parents and this age group, including plate portion size, the interpretation of the nutritional products' labels, teaching on the association among healthy eating and good health, and recommendations on physical activity. The student will provide the educational materials to each participant. Any data collected by Jorge L. Valdes will be kept confidential and stored in a password-protected computer.

We expect that Jorge L. Valdes will not interfere with the normal office performance. Furthermore, Mr. Valdes will behave professionally and follow the office standards of care. As the pediatrician in charge in CareMax Hialeah clinic, I support our medical assistants' participation in this project and look forward to work with you.

Sincerely,

Maria Perez, M.D

Pediatrician
CareMax
5378 West 16th Avenue
Hialeah, FL 33012
Telephone: (305) 820-4101,
Fax: (305) 821-5698
Email: maria.perez@caremax.com

Appendix G

Recruitment Letter

FIU | FLORIDA INTERNATIONAL UNIVERSITY

Recruitment letter for improving knowledge of parents in dietary management of children with diabetes and hyperlipidemia: A Quality Improvement Project

Dear parents,

My name is Jorge L. Valdes, and I am a student from the Graduate Nursing Department at Florida International University (FIU). I am inviting you to participate in my quality improvement project. The goal of this project is to initiate an educational program directed at parents in these communities to address community dietary management and prevent chronic conditions such as hyperlipidemia and diabetes, including obesity, in the pediatric population. You are eligible to take part in this project because your son /daughter have been diagnosed with hyperlipidemia and /or diabetes, and you will benefit to receive some education on lifestyle and nutritional modifications to decrease the risk of development of this conditions in adulthood. I contacting you with the permission of Dr. Maria Perez, the pediatrician and the management of the primary care facility where your son/daughter is attended.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. You will complete a pre-test questionnaire, which is expected to take approximately 5 minutes. Then, you will then be asked to view an approximately 10-minute-long educational module. After watching the video, you will be asked to complete the post-test questionnaire, which is expected to take approximately 5 minutes. The total amount of time will be 20 minutes including the educational module, the pre-test and the post-test assessments. No compensation will be provided.

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or you have any questions about the study, please email or contact me at jvald205@fiu.edu or 786-436-9229.

Thank you very much.

Sincerely,

Jorge L. Valdes

Appendix H

Education Through Power Point Presentation

2023

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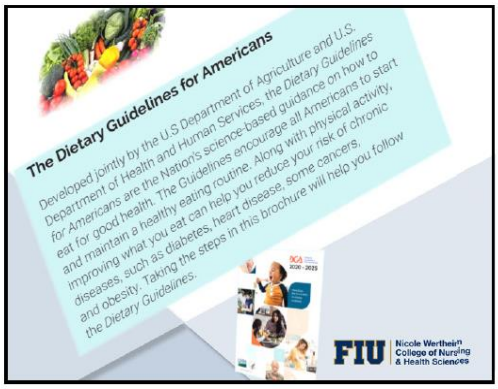
2023


The Dietary Guidelines for Americans
Developed jointly by the U.S Department of Agriculture and U.S. Department of Health and Human Services, the Dietary Guidelines for Americans are the Nation's science-based guidance on how to eat for good health. The Guidelines encourage all Americans to start and maintain a healthy eating routine. Along with physical activity, improving what you eat can help you reduce your risk of chronic diseases, such as diabetes, heart disease, some cancers, and obesity. Taking the steps in this brochure will help you follow the Dietary Guidelines.
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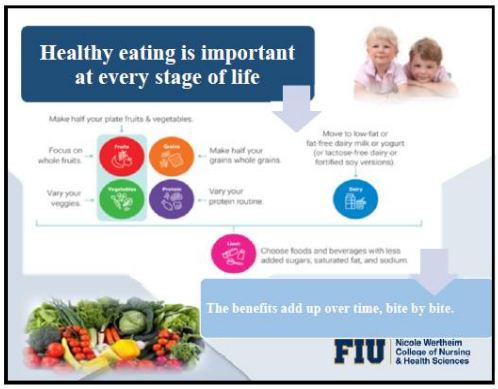
Nicole Wertheim College of Nursing & Health Sciences

4


Healthy eating is important at every stage of life
Make half your plate fruits & vegetables.
Focus on whole fruits.
Make half your grains whole grains.
Move to low-fat or fat-free dairy milk or yogurt (or lactose-free dairy or fortified soy versions).
Vary your veggies.
Vary your protein routine.
Choose foods and beverages with less added sugars, saturated fat, and sodium.
The benefits add up over time, bite by bite.
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Make every bite count
Take a look at your current eating routine. Pick one or two ways that you can switch to choices today that are rich in nutrition.
A healthy eating routine can help boost your health now and in the years to come. Think about how your food choices come together over the course of your day or week to help you create a healthy eating routine.
MyPlate.gov
It's important to eat a variety of fruits, vegetables, grains, protein foods, and dairy or fortified soy alternatives. Choose options for meals, beverages, and snacks that have limited added sugars, saturated fat, and sodium.
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2


Choose from these simple tips to help you...
Fruits
Focus on whole fruits
Start your day with fruit at breakfast. Top cereal with your favorite seasonal fruit, add bananas or chopped apples to pancakes, or mix a spoonful or two of raisins into hot oatmeal.
Keep ready-to-eat fruits in the refrigerator for a quick snack.
For dinner, chop up a combination of seasonal, frozen, or canned fruits to make a quick fruit salsa to top fish or chicken. Add fruit such as orange sections, apple wedges, or grapes to a salad.
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Vegetables
Vary your veggies
Add shredded carrots to the lettuce and tomato in your sandwich, make soup from the veggies in your vegetable drawer, and snack on raw vegetables.
Try a stir-fry with fresh or frozen vegetables for a quick meal or easy side dish.
Pick out a vegetable that the family has not tried and get a new recipe from a cookbook, website, supermarket, or friend.
Grains
Make half your grains whole grains
For breakfast, enjoy a whole-grain-based hot or cold cereal. Consider trying whole-grain puffs or flakes that are new to you—you might discover a new favorite!
Instead of sandwich bread, try a whole-grain pita, tortillas, naan or other whole-grain flatbread, sliced breads, or rolls.
Create your own trail mix with whole-grain cereal or enjoy whole-grain crackers with turkey, hummus, or avocado for a healthy whole-grain snack.
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Protein
Vary your protein routine
Broil lean beef cuts like sirloin, top round, or flank steak. Roast lean types of pork tenderloin or loin chops and slice into strips for dinner, salads, and sandwiches.
Have fish or seafood twice a week. Make a lunchtime sandwich or salad with canned tuna, grill fresh or frozen tilapia or salmon for dinner, or enjoy fish tacos.
Meatless meals are tasty and budget friendly. Try bean-based vegetarian chili or lentil soup, grilled or braised tofu with vegetables, or adding nuts to salads.
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2023


Choose foods and beverages with less added sugars, saturated fat, and sodium
Limit
Tips for Less Added Sugars
Choose packaged foods that have less or no added sugars, such as canned fruit packed in 100% juice for an easy snack, plain yogurt (you can add your own fruit)
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Dairy
Move to low-fat or fat-free dairy milk or yogurt (or lactose-free dairy or fortified soy versions)
Add low-fat or fat-free dairy to oatmeal or pureed vegetable soups instead of water, and to smoothies or scrambled eggs.
The nutrients in dairy are important at every stage of life. Include foods like low-fat or fat-free dairy milk or yogurt. Need an alternative? Try lactose-free dairy milk or yogurt that's low-fat or fat-free or fortified soy versions.
Try chilled, plain water or sparkling water with a squeeze of fruit for a splash of flavor. Limit sugary beverages such as soda, lemonade, sports drinks, or fruit drinks.
Tips for Less Saturated Fat
In place of foods higher in saturated fat, look for foods like nuts, seeds, and fatty fish like tuna, salmon, trout, and mackerel which are high in unsaturated fats and a healthier choice.
Choose canola oil, olive oil, or other vegetable oils for cooking.
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Looking for a beverage? Grab a glass of low-fat or fat-free milk or fortified soy milk (soy beverage). Choose the unsweetened option.
Tips for Less Salt and Sodium
Start simple by choosing foods with less sodium. Check the Nutrition Facts label and choose foods with a lower percent (%) Daily Value (DV) for sodium on the label, especially if a family member has high blood pressure, diabetes, or kidney disease.
Cook at home! Preparing your own food puts you in control of how much sodium goes into your meals. Add flavor to foods with herbs, spices, lemon, lime, and vinegar instead of salt or seasonings high in sodium.
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2023

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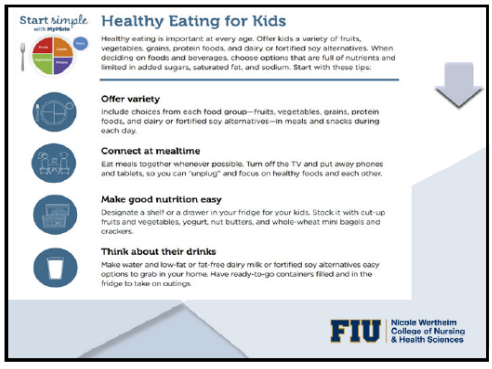

15

5

2023


Get kids involved
Depending on their age, kids can peel fruits, assemble salads, measure, scoop, and slice. Let them create and name their own side dish.
Have a shopping buddy
Let kids participate in grocery shopping online or in the store. Reward them by letting them choose their favorite fruit or maybe a new one.
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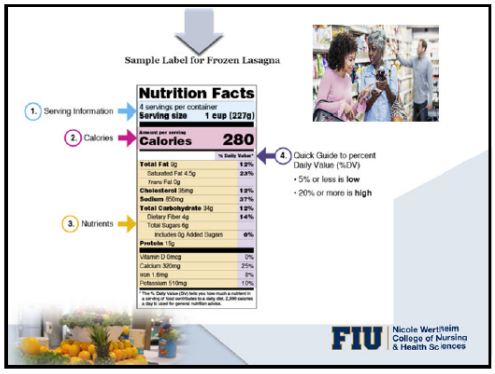
Sample Label for Frozen Lasagna
Nutrition Facts
1. Serving Information
2. Calories
Calories 280
3. Nutrients
4. Quick Guide to percent Daily Value (%DV)
• 5% or less is low
• 20% or more is high
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Lifestyle modifications for your children and your family
Avoid deep-fried foods like wafers, puries, samosas, wadas, bhajia, cutlets, farsans,etc
Consume about 6-8 glasses of water every day.
Prefer lean chicken, fish, egg white etc to high fat non-veg foods.
Use alternative cooking methods for frying like baking, steaming, grilling, poaching, etc
Festive seasons like Diwali, Christmas, and New Year are times when people just let go. Always remember that festivals can be enjoyed in a healthy way.
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2023

Lifestyle modifications for your children and your family

- **Prudence** and **self-control** are the keys to a successful weight loss program.
- Eat when you are actually hungry. Try not to eat snacks in front of television.
- It is important to follow a regular meal pattern. Consume 6 small frequent meals. The gap between two meals should not exceed to 3-4 hours.
- Never skip meals. If you skip a meal with the idea of losing weight, you tend to eat next one in more quantity.
- Eat slowly. Savor each bite. Take fifteen to twenty minutes to finish your meal as your brain needs twenty minutes to register satiety.

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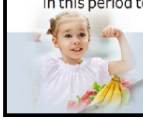
Lifestyle modifications for your children and your family

- Increase your physical activity to about 45-60 minutes in a day. Exercise is excellent to burn calories and improve both mental and physical health.
- Anticipate plateaus. They are common to all. They occur due to accumulation of water as fat is used up. Increase exercise in this period to restart weight loss.



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Lifestyle modifications for your children and your family

Physical activity and health

Regular physical activity is one of the most important things you can do for your health.

It can help to-

- Control weight.
- Reduce risk of cardiovascular diseases.
- Reduce risk of type 2 diabetes and metabolic syndrome.
- Reduce risk of some cancers.
- Strengthen bones and muscles.

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Lifestyle modifications for your children and your family

Approximately 30-60 min of moderate intensity physical activity per day is recommended.

There are various types of physical activity that help you to achieve overall fitness.

Types of activity	Benefits	Examples
1. Aerobic or cardiovascular exercises.	a) Increases stamina. b) Helps to decrease body fat. c) Improves cardiovascular function & reduces blood pressure by increasing blood flow to the muscles. d) Improves blood sugar control by increasing the sensitivity of the body to insulin.	Walking , jogging, bicycling, climbing stairs, dancing, swimming, tennis, zumba, kick boxing, Spinning.

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Thanks

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