

Improvement on Biometrics in Individuals Undergoing a 10 and 21-Day Lifestyle Intervention in a Lifestyle Medicine Clinic in Mexico

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Background: The intervention in the Lifestyle Medicine Clinic from La Carlota Hospital gives an opportunity to assess the clinical effect of a healthy lifestyle in an inpatient setting with emphasis in a plant-based diet, supervised daily exercise, sleep hygiene, psychological and optional spiritual therapies. This work evaluated the effect of short-term therapy on biometrics and blood profiles' risk factors for non-communicable diseases (NCDs).

Methods: Twenty-five patients were enrolled in the intervention, 12 for the 10-day intervention and 13 for the 21-day intervention.

Results: The intervention improved most of the NCDs risk factors: for the 10-day intervention weight decreased by -4.3% ($p < .001$), BMI -4.1% ($p < .001$), SBP -16.3% ($p = .002$), DBP -11.8% ($p = .004$), fasting glucose -31.3% ($p = .041$), total cholesterol -12.8% ($p < .001$), LDL -13.9 ($p = .017$), triglycerides and HDL lack statistical significance, however, there was a reduction of -7.7% and -9% respectively. For the 21-day intervention weight decreased by -8.3% ($p = .016$), SBP -11.2% ($p = .005$), DBP -11.4% ($p = .022$), triglycerides -39.5% ($p = .034$), total cholesterol -23.6% ($p < .000$), HDL -14.7% ($p = .038$), LDL -27.3% ($p < .000$), BMI and fasting glucose presented a -15.2% and -21.2% reduction respectively without statistical significance.

Conclusion: The present study confirms that short-term lifestyle interventions effectively reduce the risk factors associated with NCD's.

Key Words: Healthy lifestyle, Patients, Health promotion, Mexico

INTRODUCTION

Of the 56.9 million global deaths in 2016, 40.5 million,

or 71%, were due to non-communicable diseases (NCDs) [1]. In 2015, 80% of all deaths were attributed to NCDs in Mexico. Cardiovascular diseases and diabetes mellitus cause half of these deaths and in recent years, Mexico has experienced a rise in the prevalence of NCDs [2]. The increment in this prevalence is due to unhealthy lifestyle challenges such as a great number of low cost fast food choices with high salt, fat and sugar; reduction of time for preparing food, increase of the industrialized food publicity, and sedentary work and reduction in the physical activity [3,4]. Obesity, diabetes mellitus, hypertension and dyslipidemia among other chronic diseases are one of the biggest chal-

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lenges for the health care system [5].

Mexico is currently the second most obese country and recent research predicts that in 2030, 39% of the population will be obese, affecting all economic groups, low-income and high-income populations. Obesity is comorbid with heart conditions, diabetes mellitus, hypertension, cancer or sleep apnea [6,7]. In 2016, the government of Mexico declared the epidemic of diabetes a national emergency and is seeking to improve the quality of care for some 13 million people with the disease [8]. One estimate determines that the cost of managing diabetes in Mexico ranges from \$700 to \$3,200 a year, being the total annual expenditure of people with diabetes 6.027 billion dollars (78 billion pesos) [7,9]. Annually, $\approx 450\,000$ new cases of hypertension are diagnosed in Mexico and this number could double if it is considered that up to 47.3% of people with hypertension are unaware that they suffer from this disease. In 2015, hypertension was responsible for 18.1% of total deaths and labeled as the main risk factor for preventable deaths [10]. It is estimated that the care of each hypertensive patient in Mexico has an average annual cost of \$544 dollars with a total amount of \$6.30 billion [11].

Under the National Strategy for the Prevention and Control of Overweight, Obesity and Diabetes launched in 2013, Mexico has been fighting the epidemic on three fronts: public health, medical care, and fiscal and regulatory policies; with influence on food health and the promotion of physical activation. This is based on research and scientific evidence, as well as transversality, accountability and evaluation of the impact of actions [12].

Currently, lifestyle medicine is the fastest-growing area in medicine, and its gaining attention and credibility. It focuses on encouraging patients to adopt healthy habits and it is defined as “the use of evidence-based lifestyle therapeutic approaches, such as a predominantly whole food, plant-based diet, physical activity, sleep, stress management, tobacco cessation, and other nondrug modalities, to prevent, treat, and, oftentimes, reverse the lifestyle-related chronic disease that’s all too prevalent.” All components of this definition are part of a comprehensive lifestyle medicine program (Fig. 1) [13-15].

The term “lifestyle medicine” has become more popular since its first use in 1989 and this discipline has been ac-

tively developing in the United States, Australia and some countries of Europe and Asia [16], but it was until 2014 that the foundations for the Latin American Lifestyle Medicine Association (LALMA) are laid and the first International Breast Cancer Congress was organized in Lima, Peru, 2015, with the participation of worldwide prestigious organizations, developing a complete module of Lifestyle Medicine and Breast Cancer [17]. LALMA is the scientific medical professional association that represents physicians and health professionals in the countries of Latin America and the Caribbean dedicated to the advancement and practice of Lifestyle Medicine [18]. Applying lifestyle medicine into daily practice of medicine, encouraging patients to adopt and maintain change will improve outcomes and also cost of care [19].

Intensive lifestyle interventions have demonstrated short-term and long-term benefits for the management of chronic diseases and the improvement of their associated risk factors within weeks; these interventions has been applied in corporate, clinical and community settings [20,21]. CHIP (Complete Health Improvement Program) is a 30-day intensive community-based lifestyle intervention that encourages patients to move to a low-fat, plant-based diet, with emphasis on the whole-foods consumption of grains, legumes, fruits and vegetables, as well as 30 min of moderate-intensity physical activity daily and practice stress management techniques [20-22]. Residential programs offer short-term intensive lifestyle interventions and these are well-documented in medical literature; giving evidence of significant

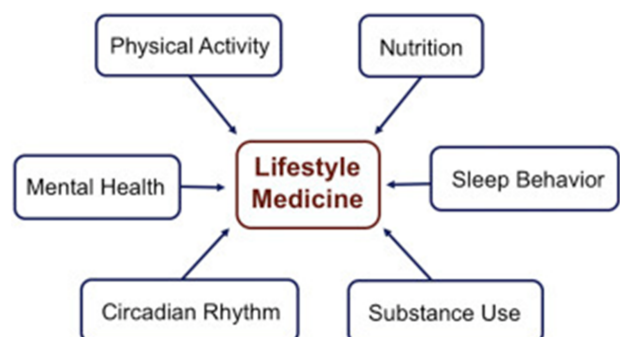


Fig. 1. The paradigm of lifestyle medicine. Physical activity, nutrition, mental health (e.g., stress management), sleep behavior, circadian patterning, and substance use (e.g., tobacco), all contribute to the discipline of lifestyle medicine.

health improvements that can be observed in the modification of biological parameters [23-28].

The present study takes place in The Lifestyle Medicine Clinic, located in the state of Nuevo Leon, northeast Mexico. The clinic is run by La Carlota Hospital, an academic medical center affiliated to The University of Montemorelos, a Seventh-day Adventist Institution also member of The Mexican Network of Health Promoting Universities.

Adventists are one of the longest-lived populations that has been formally described and they have lifestyle practices that explain their longevity: a plant-based diet with limited portions of dairy and fish, avoid tobacco, maintain a healthy body mass index and regular physical activity; each adds about two years to the life expectancy of Adventists. These variables are common recommendations of the majority of preventive medicine practices and evidence of the benefits associated with these behaviors are used by clinicians to motivate change [29,30]. Seventh-day Adventists officially explain the “Adventist lifestyle” with the word CELEBRATIONS[®], which is an acronym for 12 healthful living principles: (1) choices, (2) exercise, (3) liquid, (4) environment, (5) belief, (6) rest, (7) air, (8) temperance, (9) integrity, (10) optimism, (11) nutrition, and (12) social support and services. This philosophy involves individuals making their own choices backed by evidenced-based information [31].

The intervention in the Lifestyle Medicine Clinic from La Carlota Hospital gives an opportunity to assess the clinical effect of a healthy lifestyle in an inpatient setting. This comprehensive intervention has a strong emphasis in a plant-based diet, supervised daily exercise, sleep hygiene, psychological and optional spiritual therapies. The main purpose of the present study was to determine the effect of short-term therapy on biometrics’ risk factors for NCDs.

MATERIALS AND METHODS

The Lifestyle Medicine Clinic from La Carlota Hospital officially offers a 10 and 21-day lifestyle medicine intervention program, although patients are welcome to stay the time according to their personal circumstances; the therapy is standardized and is the same for each patient regardless the time staying in the clinic. Adaptations of the program

are applied if there is a special need by the patient; no adaptations were made for the patients in this study. In addition, the lifestyle medicine clinic also offers an outpatient service. Data were obtained by review of medical records of adult (18 and older) patients who stayed at the Lifestyle Medicine Clinic between January 1, 2016, and December 31, 2016, and strictly completed the 10 and 21-day lifestyle intervention, as well as those whose biometrics were measured before and after the intervention. Local research ethics committee approval was obtained for this study from the University of Montemorelos Research Ethics Committee (study ref. 2018-792).

A total of 25 medical records were identified as complete for this study, 12 for the 10-day intervention and 13 for the 21-day intervention. Patients were Hispanics from various locations within Mexico, 10 patients (40%) were female, 5 female patients in each group. The baseline age (Mean \pm SD) for the 10 and 21-day program was 55.3 ± 12.1 years, and 39.3 ± 15.9 years, respectively. Based on blood tests, biometrics, history, and physical examination, from the 25 patients, 20 patients were identified as having overweight or obesity, 10 patients in each group. From these 20 patients 7 were diabetics and 8 hypertensives; some of them shared both conditions and they were taking medications. One patient was identified as hypertensive not presenting overweight or obesity. The other 4 patients came to the clinic with the purpose of improving health habits and some of them had diseases such as rheumatoid arthritis, osteoarthritis, and mild depression. Only a general description of the subjects is provided since the main purpose of the present study was to determine the effect of short-term therapy on biometrics and blood profiles’ risk factors for NCDs.

The multidisciplinary team of clinical providers includes a physician who integrates the Lifestyle Medicine Competencies into the program [32], a registered dietitian, 2 certified psychologists, physical therapist, 2 nurses, a licensed chaplain and certified fitness coach. During the first visit the physician performs a comprehensive ethical interview where the intervention is described and verbal consent is obtained to use the collected data of the intervention for research purposes, detailed medical history, ordered labs, body composition test, and introduced patients to the multidisciplinary team.

1. Diet

A vegetarian diet is conducted during the intervention with a plant-based, low-fat, and whole food approach; this includes fruits, vegetables, legumes, seeds, and nuts. Health benefits have been shown for vegetarian diets in regard to NCDs such as hypertension, cardiovascular disease and metabolic syndrome, as well as a reduction in all-cause mortality [33]. Three meals a day are served (breakfast, lunch and supper) based on My Vegetarian Plate [34], which is an adaptation of the USDA MyPlate that displays balanced nutrition meeting nutrient needs for those who choose to follow a vegetarian meal pattern (Fig. 2). Consumption of tobacco products, alcohol, soda, sugary fruit drinks and caf-

feine were not permitted. As for hydration, patients were encouraged to drink 1.5-2.0 L of water daily, sometimes increasing this amount due to dehydration during optional hydrotherapy sessions. Three to five cooking workshops were offered during the intervention where patients learn how to prepare healthy and balanced dishes, sauces, dairy, and meat substitutes; workshops were directed by the physician and dietitian. Every three days patients met individually with the dietitian in a one-hour session where personalized nutrition plans were structured according to each patient's needs.

2. Physical activities

Every morning patients engaged a 30 minutes' walk and

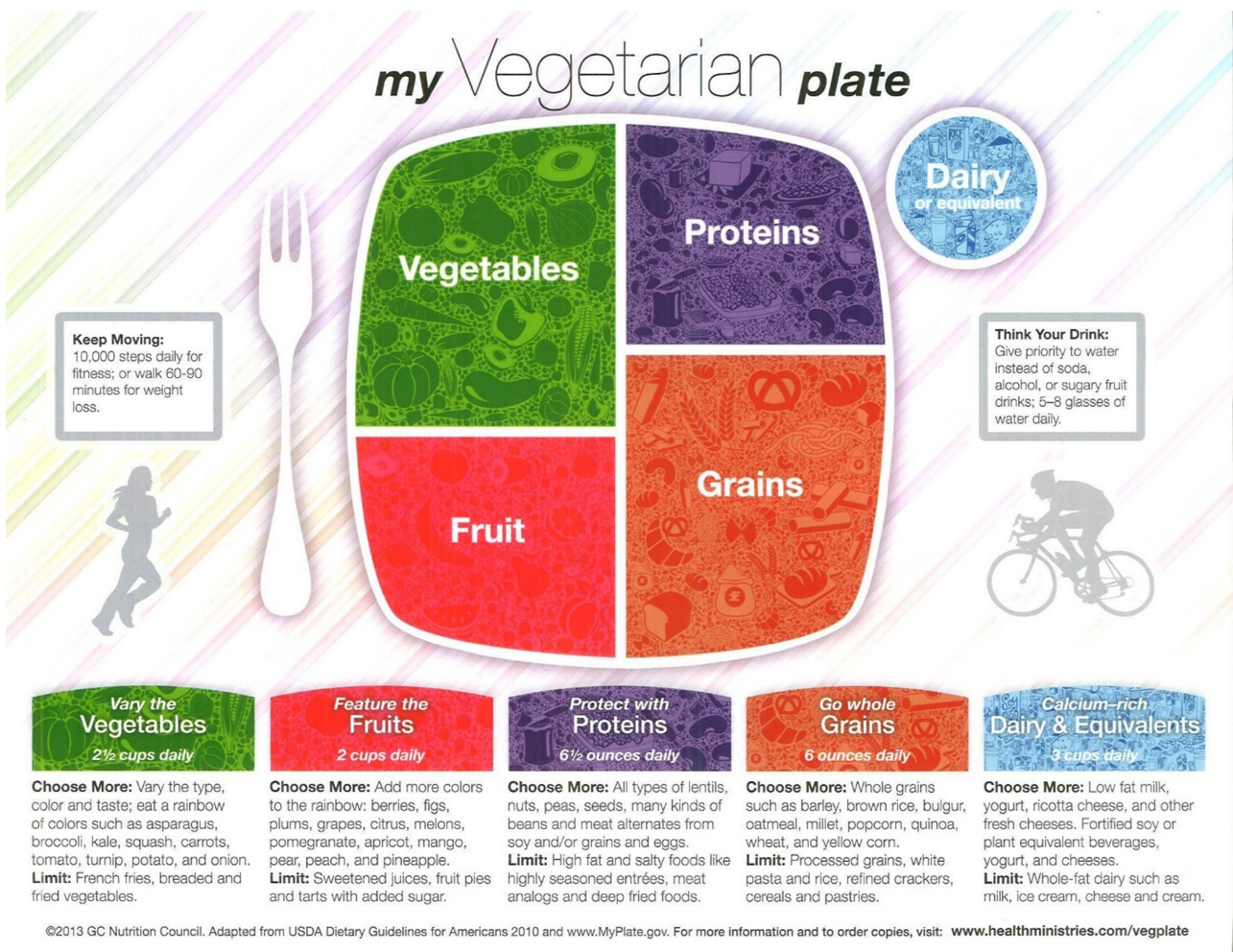


Fig. 2. My Vegetarian Plate. Vegetarian version of the USDA MyPyramid by The General Conference of Seventh-day Adventists Nutrition Council, 2013. Introduced at the International Congress on Vegetarian Nutrition, Loma Linda University, California, USA.

stretching session as well as a 10 minutes' walk after each meal. 60 minutes of a daily supervised exercise program included aerobic exercise (outdoors and indoors) and strength training in the gym. Patients had the opportunity to meet with a fitness coach for consultation and elaboration of exercise programs at home, for those who are unable to go to the gym after the intervention.

3. Psychological and spiritual interventions

A certified psychologist provided an introductory personalized session where a general mental assessment was performed. Every two days a one-hour coach session was provided with each patient where the mental health professional gave follow-up to identify patient's strengths and weaknesses for change behavior. Personal concerns and stress management were also addressed by the psychologist; only one patient was identified as having mild depression which is often treated with simple lifestyle changes, the patient was not taking medications that might alter mental status. Patients participate in a 20-minute daily session of expressive writing in addition to change behavior therapy.

Optional spiritual interventions were offered to all patients, spiritual well-being was addressed by a trained chaplain. A general one-hour session was held every morning and individual meetings were voluntarily scheduled by each patient with the chaplain. The spiritual component of this therapy is under strict supervision to avoid inaccurate given information and discard proselytizing.

4. Sleep hygiene

Principals of sleep hygiene were applied during the intervention. Establishment of a bedtime routine was essential, patients went to bed at 9:00 pm, keeping the bedroom dark and at a cool temperature. They were encouraged to avoid electronic screens at least one hour before bedtime and noise was markedly reduced in hallways and rooms. The waking up time was at 6:00 am each morning, allowing the patients to obtain enough sleep to feel rested.

5. Measurements

To establish baseline biometrics, during admission of each patient, biometric readings were taken for weight, height, body mass index (BMI), and blood pressure. Fasting (12 h)

blood samples were collected and analyzed by the laboratory of La Carlota Hospital, they were analyzed for fasting plasma glucose, total cholesterol, triglycerides, low-density lipoprotein (LDL) and high-density lipoprotein (HDL). Diabetic and hypertensive patients were monitored daily for fasting glucose and blood pressure to maintain control in their health. All patients had fasting blood drawn samples and biometric readings at the departure of the intervention to review changes in values.

6. Statistical analyses

Statistical analysis was performed using SPSS (version 24). Mean \pm SD is the format presenting the data. Values before and after the intervention were analyzed by means of student t-test, significance was set at $p < 0.05$.

RESULTS

Notable improvements in biometrics were observed over 10-day (Table 1) and 21-day (Table 2) lifestyle interventions. Reductions were recorded in all risk factors although not all presented statistical significance. For the 10-day intervention weight decreased by -4.3% ($p < .001$), BMI -4.1% ($p < .001$), systolic blood pressure -16.3% ($p = .002$), diastolic blood pressure -11.8% ($p = .004$), fasting glucose -31.3% ($p = .041$), total cholesterol -12.8% ($p < .001$), LDL cholesterol -13.9 ($p = .017$), triglycerides and HDL cholesterol lack statistical significance, however, there was a reduction of -7.7% and -9% respectively. On the other hand, for the 21-day intervention weight decreased by -8.3% ($p = .016$), systolic blood pressure -11.2% ($p = .005$), diastolic blood pressure -11.4% ($p = .022$), triglycerides -39.5% ($p = .034$), total cholesterol -23.6% ($p < .000$), HDL cholesterol -14.7% ($p = .038$), LDL cholesterol -27.3% ($p < .000$), BMI and fasting glucose presented a -15.2% and -21.2% reduction respectively without statistical significance. It is worth mentioning that at the end of the 10-day intervention, two patients taking high blood pressure medication reduced their daily dose, one patient had a reduction of 25% and the other a 50% reduction. One diabetic patient with an initial dose of 30 units of insulin was using 25 units at the end of the intervention. As for the 21-day intervention, one patient with both conditions, hypertension, and

Table 1. 10 days lifestyle intervention (N = 12)

Factor	Baseline Mean \pm SD	After intervention, Mean \pm SD	Change (%)	p-value
Weight (kg)	83.2 \pm 22.1	79.6 \pm 20.6	-4.3	.001
Body mass index (kg/m ²)	31.1 \pm 7.3	29.8 \pm 6.8	-4.1	.001
Systolic blood pressure (mm Hg)	152.1 \pm 24.1	127.3 \pm 13.0	-16.3	.002
Diastolic blood pressure (mm Hg)	89.5 \pm 10.0	78.9 \pm 10.6	-11.8	.004
Fasting glucose (mg/dL)	139.4 \pm 69.8	95.7 \pm 17.1	-31.3	.041
Triglycerides (mg/dL)	176.2 \pm 82.4	162.6 \pm 72.3	-7.7	.487
Total cholesterol (mg/dL)	187.7 \pm 46.1	163.5 \pm 55.8	-12.8	.001
HDL cholesterol (mg/dL)	46.5 \pm 12.1	42.3 \pm 13.9	-9	.105
LDL cholesterol (mg/dL)	112.7 \pm 44.5	97.0 \pm 50.1	-13.9	.017

Table 2. 21 days lifestyle intervention (N = 13)

Factor	Baseline Mean \pm SD	After intervention Mean \pm SD	Change (%)	p-value
Weight (kg)	78.7 \pm 19.9	72.1 \pm 22.7	-8.3	.016
Body mass index (kg/m ²)	31.4 \pm 8.8	26.6 \pm 5.1	-15.2	.088
Systolic blood pressure (mm Hg)	128.5 \pm 15.0	114.1 \pm 11.4	-11.2	.005
Diastolic blood pressure (mm Hg)	81.4 \pm 14.4	72.1 \pm 7.9	-11.4	.022
Fasting glucose (mg/dL)	109.3 \pm 62.9	86.1 \pm 12.0	-21.2	.142
Triglycerides (mg/dL)	143.8 \pm 81.7	86.92 \pm 44.0	-39.5	.034
Total cholesterol (mg/dL)	191.8 \pm 30.0	146.4 \pm 28.4	-23.6	.000
HDL cholesterol (mg/dL)	54.1 \pm 17.0	46.1 \pm 12.3	-14.7	.038
LDL cholesterol (mg/dL)	112.5 \pm 32.2	81.7 \pm 21.0	-27.3	.000

diabetes, was taking two high blood pressure medications and using insulin along with metformin and simvastatin, at the end of the intervention, this patient was taking only one high blood pressure medication and he was weaned from insulin.

DISCUSSION

Reductions in noncommunicable disease risk factors were achieved within the 10 and 21-day lifestyle medicine intervention. The present study confirms that short-term lifestyle interventions effectively reduce the risk factors associated with NCDs. Different models of lifestyle interventions have been described in the literature and all proved to be effective, however incorporating the concept of improving quality of life must become a lifestyle medicine intervention objective, and not only focus on symptom reduction as the primary outcome of treatment and research [35]. The Global action plan for the prevention and control of

noncommunicable diseases launched by the WHO in 2013, includes voluntary global targets that if analyzed they are directed towards prevention of disease and lifestyle changes [36], therefore the importance of these studies that approach the cause and not merely the disease. The prevention and control of NCDs should be considered as a priority for the health care system due to the growth in its incidence and lethality, in addition to the high cost of care and late attention with little satisfactory outcomes in many cases.

COVID-19 is a pandemic that must highlight the high burden that NCDs place on health resources [37]. According to the Mexican Ministry of Health, of the total number of Mexicans who have died from complications of COVID-19, 71% had comorbidity such as hypertension, obesity, diabetes, smoking, chronic kidney failure, chronic obstructive pulmonary disease (COPD), some cardiovascular disease, immunosuppression, asthma or HIV [38]. In the United States the consequences of NCDs over COVID-19 are just as real and over 5 times as prevalent [39]. Katie Dain, chief

executive of NCD Alliance, states that COVID-19 has been unforgiving on people living with NCDs and has laid bare the failure of the vast majority of governments worldwide to adequately guarantee the health of its citizens [40].

This study is subject to some limitations such as the small sample size and absence of a control group. Lack of follow-up for measurement of long-term changes in lifestyle behaviors after the interventions is a challenge to overcome on further research. A community-based intervention model would be a very innovative and cost-effective initiative to determine if we can mimic the same results.

The 10 and 21-day lifestyle intervention provides valuable information of health behaviors that will impact positively the biological risk factors for NCDs. This study also gives evidence that a multidisciplinary approach is the best strategy to intervene NCDs and obtain a satisfactory outcome.

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