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# Preoperative Laboratory Testing by Surgeons: Implication on Anaesthetic Management

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## Abstract

**Background:** Request for preoperative laboratory investigations is usually done by surgeons. On some occasions, the patient may come with laboratory investigations that have been requested by the primary physician. This occurs in situations where the primary physician saw the patient first and referred to the surgeon. There is usually no indications based on history or physical examination before these laboratory request is done but rather on speculations that the "anaesthetist may require them". This is done in order to avoid cancellation or delay of cases. The aim of this study was to find out how tests ordered in Komfo Anokye Teaching Hospital (K.A.T.H.) by the surgeons affected the decisions of the anaesthetists in the perioperative management of the patients. **Methodology:** This was a prospective, cross sectional study of patients undergoing elective surgery at K.A.T.H from 1st to 31st March 2014. A quantitative technique was used to effectively quantify laboratory results that were contained in a patient's folder before an elective surgical procedure. A close and open-ended questionnaire was developed and answered by reviewing patient's folders during the pre-anesthesia assessment. Data were analyzed using Statistical Package of Social Sciences (SSPS) version 22. **Results:** The average age of patients studied was 50 years. Abnormal test results did not influence the anaesthetic management in 70.5% of cases but led to either delay or cancelation of cases or requirement for transfusion of blood or blood products in 29.5% of cases. **Conclusion:** Preoperative laboratory tests ordered by Surgeons in KomfoAnokye Teaching Hospital do not significantly influence the anaesthetic managements of patients.

## Keywords

Preoperative, Laboratory Investigations, Surgeons, Anaesthetic Management, Implication

## 1. Introduction

A preoperative laboratory test is done as part of the requirement for pre-anesthetic assessment. Traditionally a lot of importance is attached to these laboratory tests because of its importance in the evaluation of the patient's fitness for anaesthesia and surgery [1] [2].

Even though these laboratory tests are important, it should not be requested arbitrary. There should always be an indication for requesting any laboratory investigation. The request should be based on the patient's history, physical examination and the risk of the surgical procedure. A lot of institutions have their guidelines for ordering preoperative laboratory tests. However, a test is likely to be indicated only if it can correctly identify abnormalities and will change the diagnosis, the management plan, or the patient's outcome [3] [4].

The ordering of preoperative laboratory tests should hinge on specific clinical indications that are likely to increase the peri-operative risk and not simply based on the fact that the patient is undergoing a surgical procedure [5].

The practice of ordering routine laboratory tests for all patients undergoing surgery without taking into consideration, the patient's age or medical history is no longer considered medically appropriate [5].

In a lot of institutions, it is the surgeon or the primary physician who orders the pre-operative laboratory test. In most situations, these tests are ordered not based on any specific indication or the history and examination obtained from the patient. In most situations, the ordering of the laboratory tests is based on the speculation that the anaesthetists may require them to proceed with the surgery and thus avoid delays and cancellations [5] [6].

A study conducted by Vogt A. W *et al.* concluded that an average of 72.5 % of tests ordered by surgeons was considered not indicated by the anaesthesiologists. Anaesthesiologists are the peri-operative medicine experts and are best qualified to establish an appropriate and necessary preoperative laboratory and diagnostic tests for intra-operative anaesthesia management [5]. Routine laboratory testing before elective surgery in healthy patient has limited clinical relevance and will seldom change the anaesthetic care plan or influence outcome [7]; however, the use of routine laboratory investigations before elective surgery is rampant [2]. This study sought to find out how tests ordered in Komfo Anokye Teaching Hospital by the surgeons affected the decisions of the anaesthetists in the peri-operative management of the patients.

## 2. Methods

This was a prospective, cross-sectional survey which involved patients undergoing elective surgical procedures at the Komfo Anokye Teaching Hospital, Kumasi, Ghana. After ethical clearance from the committee for human research publication and ethics, a census from 1st-31st March 2014 was done to collect data from folders of patients presenting for various surgical procedures that met the inclusion criteria, and the anaesthetist who anaesthetized the patients filled

the final part of the questionnaire. The folders of all the patients presenting for elective surgery during the study period were reviewed. A quantitative technique was used to effectively quantify laboratory results that were contained in a patient's folder before an elective surgical procedure. Close and open-ended questionnaire was developed and answered by reviewing patient's folders during the pre-anaesthesia assessment. Part of the questionnaire was answered by the attending anaesthetist immediately after the surgical procedure had been performed. In all, a total of one hundred and sixty five patients were enrolled in the study.

## 3. Data Analysis

The data was analyzed using Statistical Package of Social Sciences SPSS version 22 and Microsoft Excel 2010. The results were presented in the form of frequency tables.

## 4. Results

The study population was 165 candidates with a mean age of 50 years and a male to female ration of 1:1.1. At the time of pre-anaesthetic review, all the candidates had at least one laboratory result. 98.8% of the laboratory tests were ordered by the surgical team while the anaesthetist was responsible for only 1.2% of all laboratory requests (Table 1).

Table 2 shows that complete blood count was ordered most frequently among candidates studied (98.8%) while thyroid function test was the least ordered in 5.5% of the population. Of the 163 candidates in whom CBC was requested, results were normal in 122 (74.8%) and abnormal in 41 (25.2%). Abnormal results were also seen in 14.4%, 3.2%, 20.9% and 46.2% of candidates who had renal function test (RFT), serum electrolytes, liver function test (LFT) and coagulation studies done respectively.

These abnormal test results did not however influence the anaesthetic management in 70.5% of cases but led to either delay or cancelation of cases or requirement for transfusion of blood or blood products in 29.5% of cases (Figure 1 and Table 3).

Furthermore, Table 4 reveals that most of the tests ordered were not necessary according to the Canadian Anesthesiologist Society guidelines for pre-operative testing (Table 5) and were thus routinely ordered.

## 5. Discussions

Our study shows that laboratory tests ordered by surgeons were not indicated in 39.3% of cases when compared to the Canadian Anesthesiologist Society. Abnormal results did not influence the anaesthetic management in 70.5% of cases but rather led to either delay or cancelation or requirement for transfusion of blood or blood products in 29.5% of cases. Most of the changes were based on very low haemoglobin levels. This trend is similar to the findings of Riyard M *et al.*

**Table 1.** Demographic and pre-surgical characteristics.

| Characteristics Value | Percentage | |
|---|---|---|
| Number of patients | 165 | |
| Mean age (years) ± SD | 50 | |
| Male to female ratio | 1:1:1 | |
| Who orders Lab Investigations? And frequency of pre-anaesthetic lab results | | |
| Surgeons | 163 | 98.8 |
| Anaesthetists | 2 | 1.2 |
| Pre-anaesthetic lab results | 165 | 100 |

**Table 2.** Frequency of tests ordered.

| Lab test | Not Requested | Requested | Normal | Abnormal |
|---|---|---|---|---|
| Complete blood count | 2 (1.2%) | 163 (98.8%) | 122 (74.8%) | 41 (25.2%) |
| Renal function test | 40 (24.2%) | 125 (75.8%) | 107 (85.6%) | 18 (14.4%) |
| Bldgrping and matching | 60 (36.4%) | 105 (63.6% | 105 (100%) | 0 (0.0%) |
| Serum electrolytes | 71 (43.0%) | 94 (57.0%) | 91 (96.8%) | 3 (3.2%) |
| Liver function test(LFT) | 117 (70.9%) | 48 (29.1%) | 38 (79.1%) | 10 (20.9%) |
| Urinalysis | 146 (88.5%) | 19 (11.5%) | 19 (100%) | 0(0.0%) |
| Blood glucose | 147 (89.1%) | 18 (10.9%) | 18 (100%) | 0 (0.0%) |
| Coagulation studies | 152 (92.1%) | 13 (7.9%) | 7 (53.8%) | 6 (46.2%) |
| Thyroid function test | 156 (94.5%) | 9 (5.5%) | 9 (100%) | 0 (0.0%) |
| Haemoglobin | 165 (100%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Haematocrit | 165 (100% | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |
| Pregnancy evaluation | 165 (100%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) |

**Table 3.** Changes made in anaesthetic management based on laboratory results.

| | CBC | CS | SE | RFT | LFT | Total |
|---|---|---|---|---|---|---|
| Cancellation/delay of surgery | 3 (7.3%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 3 (3.9%) |
| Transfusion of Bld/Bld products | 12 (29.3%) | 0 (0.0%) | 1 (33.3%) | 4 (22.2%) | 3 (30.0%) | 20 (25.6%) |
| No changes made | 26 (63.4%) | 6 (100%) | 2 (66.7%) | 14 (77.8%) | 7 (70.0%) | 55 (70.5%) |
| Total | 41 (100%) | 6 (100%) | 3 (100%) | 18 (100%) | 10 (100%) | 78 (100%) |

Bld—blood; CBC—complete blood count; CS—coagulation studies; SE—serum electrolytes; RFT—renal function test; LFT—liver function test.

[8]. In their study, only 30 (3.38%) of 839 patients in whom complete blood count was indicated and 2 (0.18%) of 1091 patients in whom the test was indicated had interventions respectively. No interventions occurred in patients with

**Table 4.** Number of investigations that were indicated or not indicated according to the Canadian Anesthesiology Society guidelines for preoperative laboratory testing.

| Laboratory test | Indicated | Not indicated |
|---|---|---|
| Complete blood count (%) | 124/163 (76.1) | 39/163 (23.9) |
| Serum electrolytes (%) | 56/94 (59.6) | 38/94 (40.4) |
| Renal function test (%) | 57/125 (45.6) | 68/125 (54.4) |
| Coagulation studies (%) | 8/13 (61.5) | 5/13 (38.5) |
| Average percentage | 60.7 | 39.3 |

**Table 5.** The Canadian Anaesthesiology Society Guidelines for preoperative laboratory testing.

| Test | Indications |
|---|---|
| **Complete Blood Count** | · Patient more than 60 years of age<br>· Major surgery requiring "group and screen" or "group and match"<br>· Chronic cardiovascular, pulmonary, renal or hepatic disease<br>· Malignancy<br>· Known or suspected anemia, bleeding diathesis or myelosuppression<br>· Anticoagulant therapy |
| **Coagulation profile** | · Anticoagulant therapy<br>· Bleeding diathesis, family history of bleeding disorder<br>· History of DVT or pulmonary embolism<br>· Liver disease, renal failure<br>· Malignancy with concurrent radio-chemotherapy |
| **Electrolytes and creatinine levels** | · Age more than 60 years<br>· Hypertension<br>· Renal disease<br>· Diabetes<br>· Pituitary or adrenal disease<br>· Digoxin or diuretic therapy, or other drug therapies affecting electrolytes |

abnormal coagulation profile as was the case with our study. Interventions were also low in patients with abnormal serum electrolytes. The lower figures for this study may be explained by the relatively larger population when compared to ours.

In a randomized, single-blind, prospective, controlled pilot study to determine whether indicated preoperative testing can be eliminated without increasing the perioperative incidence of adverse events in selected patients undergoing ambulatory surgery, one thousand and sixty-one eligible patients were randomized either to have indicated preoperative testing or no preoperative testing. In the indicated testing group, patients received indicated preoperative testing: a

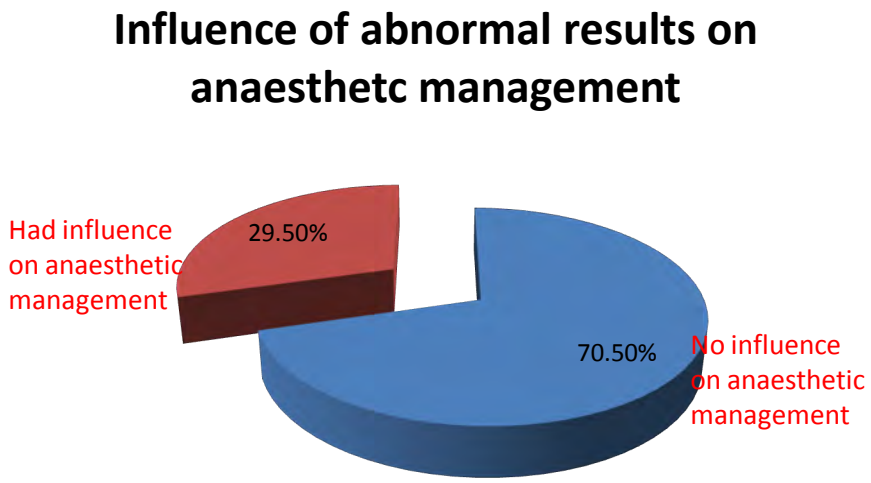


**Figure 1.** Influence of abnormal results on anaesthetic management.

complete blood count, electrolytes, blood glucose, creatinine, electrocardiogram, and chest radiograph according to the Ontario Preoperative Testing Grid as per current practice, whereas in the no testing group, no testing was ordered. Although patients' age, gender, American Society of Anesthesiologists status, type of surgery, and anesthesia were similar between the two groups, there were no significant differences in the rates of perioperative adverse events and the rates of adverse events within 30 days after surgery between the no testing group and the indicated testing group [9].

In the early 1940s when preoperative assessment evolved, preoperative investigations were based on thorough history and physical examination during preoperative visit. Laboratory test ordered was done selectively to confirm diagnosis [10]. However in the late 1960s when test ordering became easier because of the introduction of biochemical auto-analyzers routine testing became common because it was equated to efficient care [2].

Many hospitals adopted this behaviour to perform a series of laboratory test prior to surgical operations with the assumption that voluminous information would enhance the safety of surgical patients [2]. The practice continued without any scientific evidence until Kaplan *et al.* published an academic paper to debunk the practice. In their study a retrospective review of charts of over 2000 elective surgical patients who underwent a battery of tests including complete blood cell count, differential blood count, prothrombin time, glucose level, serum electrolytes, creatinine, platelet count, etc, they demonstrated that only 96 (22%) tests revealed abnormalities. Of 96 abnormal test results, only 10 could not be determined by history and examination, of which only 4 were of actual clinical significance [11].

Although some test abnormalities are clearly of concern (e.g. raised blood sugar), others may have little or no effect on peri-operative anaesthetic management or outcome e.g. white blood cell count [2]. Available consensus indicates that only selective tests should be advised, considering patients health

status, presence of medical diseases, current medication, invasiveness or risk of proposed operative procedure (minimally, moderately or highly invasive), and potential for blood loss. The tests should be obtained for specific clinical indication (e.g. obtain blood glucose in a known or suspected patient of diabetes or require complete blood count in surgeries where moderate or severe blood loss is expected) that may increase peri-operative risk or influence management of anaesthesia or surgery and not simply because the patient is to undergo surgery [2].

Healthy patients of ASA physical status I and II without co-existing medical condition undergoing minimally invasive outpatient surgery may require no routine investigations, whereas those scheduled for moderately or severely invasive surgery which causes major physiological stress, a few baseline tests may be done. Further testing is needed only as per specific medical condition. In older patients with medical diseases, the likelihood of abnormal tests is higher; therefore more liberal testing may be done. However, using age as a criterion for routine tests is debated and ASA physical status and risk of surgery are considered better predictors of surgical outcome in elderly patients [10].

## 6. Conclusion

Preoperative laboratory tests are ordered by surgeons in Komfo Anokye Teaching Hospital. Most of the results are normal and even the abnormal results do not significantly influence the anaesthetic managements of patients. We recommend that ordering of preoperative investigation should be the responsibility of the anaesthetist during preoperative assessment; the practice of surgeons ordering preoperative laboratory investigations for the anaesthetist should be minimised.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

[1] (2008) Standards and Practice Parameters, ASA House of Delegates. Routine Preoperative Laboratory and Diagnostic Screening. Google Search.

[2] Kumar, A. and Srivastava, U. (2011) Role of Routine Laboratory Investigations in Preoperative Evaluation. *Journal of Anaesthesiology Clinical Pharmacology*, **27**, 174-179. https://doi.org/10.4103/0970-9185.81824

[3] Hepner, D.L. (2009) The Role of Testing in the Preoperative Evaluation. *Cleveland Clinic Journal of Medicine*, **76**, S22-S27. https://doi.org/10.3949/ccjm.76.s4.04

[4] Feely, M.A., Collins, C.S., Daniels, P.R., Kebede, E.B., Jatoi, A. and Mauck, K.F. (2013) Preoperative Testing before Noncardiac Surgery: Guidelines and Recommendations. *American Family Physician*, **87**, 414-418.

[5] Fischer S.P., Bader, A.M. and Sweitzer, B. (2009) Preoperative Evaluation. In: Miller, R.D., Eds., *Millers Anesthesia*, 7th Edition, Chapter 34, Elsevier Churchill Li-

vingstone, London.

[6] Brown, S.R. and Brown, J. (2011) Why Do Physicians Order Unnecessary Preoperative Tests? A Qualitative Study. *Family Medicine*, **43**, 338-343.

[7] Smetana, G.W. and Macpherson, D.S. (2003) The Case Against Routine Preoperative Laboratory Testing. *Medical Clinics of North America*, **87**, 7-40.

[8] Riyad, M., Al Saied, G., Alshareef, A., Uddin, S., Abdulkarim, Y and Muhaimeed, K. (2013) Usefulness of Routine Preoperative Laboratory Tests in Elective Surgical Patients. *The Internet Journal of Surgery*, **30**, 1-6.

[9] Chung, F., Yuan, H., Yin, L., Vairavanathan, S. and Wong, D. (2009) Elimination of Preoperative Testing in Ambulatory Surgery. *Anesthesia & Analgesia*, **108**, 467-475. https://doi.org/10.1213/ane.0b013e318176bc19

[10] National Collaborating Centre for Acute Care. NICE Guideline for Preoperative Investigations in Patients Undergoing Elective Surgery. Published June 2003.

[11] Kaplan, E.B., Sheiner, L.B., Boeckmann, A.J., Roizen, M.F., Beal, S.L., Cohen, S.N., *et al.* (1985) The Usefulness of Preoperative Laboratory Screening. *The Journal of the American Medical Association*, **253**, 3576-3581. https://doi.org/10.1001/jama.1985.03350480084025

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# Ocular Changes in Egyptian Children on Regular Hemodialysis

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## Abstract

**Background:** Chronic Kidney disease (CKD) may cause ocular disorders for many reasons such as uraemia, haemodialysis and hypertension. **Aim:** To study the ocular changes in a group of Egyptian children with chronic kidney disease on regular hemodialysis. **Subjects and Methods:** This cross-sectional comparative study was conducted on 30 children on regular hemodialysis and another 30 age and sex-matched healthy children as controls. Their ages ranged from 4 to 17 years. Complete ophthalmological examination including; visual acuity and refraction, anterior segment examination, intraocular pressure (IOP), fundus examination and colored photography were assessed in the same line with routine laboratory investigations for children on regular hemodialysis and their controls. The relation of ocular disorders with related clinical and biochemical variables was measured statistically. **Results:** The most common eye abnormalities recorded were decreased visual acuity in Lt eye (73.3%) and Rt eye (60%), followed by corneal & conjunctiva calcification were (16.7%) and (13.3%) respectively and fundal changes (13.3%) of the study population. A significant positive relation was found between fundal changes particularly tortuous blood vessel abnormalities with the duration of hemodialysis and serum creatinine level. **Conclusion:** Ocular abnormalities are common than expected in children on regular hemodialysis. Visual acuity disorder is the major ocular abnormalities recorded in those patients. Regular ophthalmologic assessment is recommended in children to prevent longer-term visual complications.

## Keywords

Hemodialysis, Children, Ocular Changes

## 1. Introduction

Although much progress has been made in prevention, detection and treatment, CKD remains a major public health problem [1].

In children, early diagnosis and detection of the etiologic factors are important to improve their health outcomes [2].

Patients undergoing chronic hemodialysis (HD) are subject to the unique effects of both uremia and the dialysis procedure on multiple organ systems. Many patients on chronic HD suffer from chronic eye diseases [3].

Chronic kidney disease of any etiology can induce eye disorders secondary to metabolic changes and hemodialysis treatment [4].

Eye changes associated with chronic renal disease include conjunctival erythema, metastatic calcification on the ocular surface, conjunctival degenerations, dry eye, band keratopathy, corneal endothelial impairments, uremic optic neuropathy, pseudotumor cerebri, uremic amaurosis and cataracts [4].

Hemodialysis could influence on visual parameters through changes in blood glucose or possibly other systemic parameters [5].

The aim of this work was to study the ocular changes in a group of Egyptian children with chronic kidney disease on regular hemodialysis.

## 2. Subjects and Methods

This is a cross-sectional comparative study, conducted during the period from May 2016 to January 2017. The study included 60 Egyptian children, 30 children with end stage renal disease (ESRD) (eGFR < 15 mL/min/1.73m$^2$) on regular hemodialysis more than 3 months at the time of the study [6]. They were on regular hemodialysis for 4 hours, 3 times weekly, by Fresenius 4008S machine Fresenius Medical Care AG, Bad Homburg, Germany, with polysulfone low flux membrane dialyzer, their ages ranged from (5 - 17) years. Also 30 healthy children with matched age and sex with patients were included as controls. The study population was selected from the nephrology & hemodialysis unit and the outpatients pediatric clinic of Alzahraa University Hospital. Blood samples were drawn in the morning after an overnight fast of at least 12 h before the start of the mid-week HD session.

- **Children with:** Primary eye disorders (acute and chronic), other chronic systemic illnesses that can affect the eye (e.g., rheumatoid arthritis, cystinosis, …) were excluded from the study. The study patients were subjected to full history (etiology and duration of CKD and dialysis), any ocular manifestations and history of recurrent eye infection, visual affection (visual acuity disorders—dryness—itching—red eye). Informed consent was obtained from the participating parents in adherence to the guidelines of the ethical committee of Alzhraa Hospital, Al-Azhar University, Cairo, Egypt.
- **Clinical examination:** Meticulous complete general and local systemic examination with special emphasis on manifestations of systemic disease which may affect the eye, and laboratory investigations in the same line with complete ophthalmologic assessment for both patients and their controls.

### 2.1. Sampling

Blood samples were drawn in the morning after an overnight fast of at least 12 h

before the start of the mid-week HD session. Five ml were drawn and placed into a plain tube, centrifuged within 30 minutes of collection and serum was separated and divided into:

1) One portion for serum (creatinine, urea, Ca, ph, ALP, cholesterol and triglyceride at the same day;

2) Another portion stored at −20˚C for until PTH assay.

### 2.2. Ophthalmologic Examination

All enrolled subjects had complete ophthalmic examination, including uncorrected and best corrected visual acuity, intraocular pressure estimation using Goldmann applanation tonometer, anterior segment examination, dilated fundus examination with indirect ophthalmoscope and slit-lamp biomicroscopic examination with +90 non-contact lens. For statistical analysis, visual acuity was converted to logMar fraction (Table 1).

## 3. Results

Table 2 showed significant increase in systolic blood pressure, urea, creatinine, PTH, ALP, cholesterol and triglyceride serum levels in children on hemodialysis

Table 1. LogMar visual acuity conversion chart.

| Snellen acuity | LogMAR acuity |
|---|---|
| 6/240 | 1.6 |
| 6/190 | 1.5 |
| 6/150 | 1.4 |
| 6/120 | 1.3 |
| 6/95 | 1.2 |
| 6/75 | 1.1 |
| 6/60 | 1.0 |
| 6/48 | 0.9 |
| 6/38 | 0.8 |
| 6/30 | 0.7 |
| 6/24 | 0.6 |
| 6/19 | 0.5 |
| 6/15 | 0.4 |
| 6/12 | 0.3 |
| 6/9.5 | 0.2 |
| 6/7.5 | 0.1 |
| 6/6 | 0.0 |
| 6/4.8 | −0.1 |
| 6/3.8 | −0.2 |

MAR: Minimum Angle Resolutions.

**Table 2.** Comparison between patients and control group regarding laboratory data.

| Variable | Control group (No. = 30) | Patients group (No. = 30) | Independent t-test | |
|---|---|---|---|---|
| | Mean ±SD | Mean ±SD | t/X* | P-value |
| Age (years) | 11.60 ± 2.24 | 12.27 ± 4.10 | −0.782 | 0.438 |
| Sex | | | | |
| male | 15 (50.0%) | 18 (40.0%) | 0.606* | 0.436 |
| female | 15 (50.0%) | 12 (60.0%) | | |
| Systolic BP (mmHg) | 110.93 ± 8.75 | 131.63 ± 12.59 | 7.396 | **0.001** |
| Diastolic BP (mmHg) | 71.60 ± 5.62 | 84.30 ± 6.04 | 8.432 | **0.000** |
| Zscore: weight | 0.27 (−0.14 - 0.79) | −0.77 (−1.35 - 0.65) | 2.750 | **0.006** |
| Zscore: height | 0.18 (−0.01 - 0.76) | −0.30 (−0.91 - 0.63) | 2.642 | **0.008** |
| Zscore: BMI | 0.37 (−0.08 - 0.71) | −0.53 (-1.24 - 0.52) | 2.737 | **0.006** |
| Urea (mg/dl) | 18.43 ± 3.16 | 174.56 ± 46.67 | −18.280 | **0.001** |
| Creatinine (mg/dl) | 0.57 ± 0.18 | 8.10 ± 2.10 | −19.583 | **0.001** |
| Ca (mg/dl) | 9.66 ± 0.46 | 9.69 ± 2.69 | 0.060 | 0.952 |
| Phosphate (mg/dl) | 4.34 ± 0.30 | 8.21 ± 3.55 | 5.431 | **0.001** |
| PTH(Pg/ml) | 50.23 ± 14.38 | 816.01 ± 604.28 | 5.214 | **0.001** |
| ALP (U/L) | 187.87 ±30.23 | 418.08 ±166.69 | 6.796 | **0.001** |
| Cholesterol (mg/dl) | 102.48 ± 11.85 | 149.40 ± 35.40 | 6.884 | **0.001** |
| TG (mg/dl) | 81.52 ± 19.69 | 138.44 ± 60.54 | 4.897 | **0.001** |

*: Chi-square test.

compared to their controls with no significant difference regarding serum Ca level between both groups, but there is a significant decrease in z score of (Wt, Ht and BMI) in hemodialysis group compared to their controls.

Table 3 showed that visual abnormalities were detected in 18 children (60%) in the Rt eye and 22 (73.3%) in the Lt eye among patients group in comparison to the controls visual abnormalities were detected in 4 of them (13.3%) in either eye. There was a significant decrease in the degree of visual acuity in children on hemodialysis than their controls.

Table 4 showed that out of 30 patient, 2 patients (6.7%) had dry eyes symptoms, conjunctiva calcification was detected in 4 patients (13.3%) and conjunctiva pigmentation in 4 patients (13.3%), corneal calcification, in 5 patients (16.7%), 4 patients (13.3%) developed fundus abnormalities, 3 patients (10%) had intra-retinal Hge and only one patient (3.3%) had myopic fundus.

Figure 1 showed corneal and conjunctival calcification of both eyes in one of the study patients group who examined by Topcon, retinal camera.

Figure 2 showed diffuse retinal hemorrhage in one of the study patients group who examined by Topcon, retinal camera.

Table 5 showed a significant relation between duration of hemodialysis, serum creatinine level and tortuous blood vessels of the fundus.

Table 6 showed the frequency of ocular findings in the study patients group, it revealed that the commonest detected finding is visual acuity disorders followed by conjunctiva calcification.

**Table 3.** Comparison between patients group and their controls regarding the frequency and the degree of visual acuity disorders.

| Variable | | Control group No. = 30 | | Patients group No. = 30 | | Chi-square test | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | $X^2$ | P-value |
| V/A Rt | Negative | 26 | 86.7% | 12 | 40.0% | 14.067 | **0.001** |
| | **Positive** | 4 | 13.3% | 18 | 60.0% | | |
| V/A Lt | Negative | 26 | 86.7% | 8 | 26.7% | 21.991 | **0.001** |
| | **Positive** | 4 | 13.3% | 22 | 73.3% | | |
| Degree of V/A R t | | Mean ± SD No. = 30 | | Mean ± SD No. = 30 | | t | P-value |
| | | 0.03 ± 0.07 | | 0.29 ± 0.34 | | 4.102 | **0.001** |
| Degree of V/A Lt | | 0.03 ± 0.07 | | 0.29 ± 0.30 | | 4.623 | **0.001** |

V/A: visual acuity.

**Table 4.** Comparison between patients group and their controls regarding the frequency of eye symptoms (dry eye), anterior segment examination, fundus changes and retinal abnormalities.

| Variable | | Control group (n = 30) | | Patients group (n = 30) | | Chi-square test | |
|---|---|---|---|---|---|---|---|
| | | No. | % | No. | % | $X^2$ | P-value |
| Dry eye | No | 30 | 100.0% | 28 | 93.3% | 2.069 | 0.150 |
| | Yes | 0 | 0.0% | 2 | 6.7% | | |
| Eye lid abnormalities | Negative | 30 | 100.0% | 27 | 90.0% | 3.158 | 0.076 |
| | Positive | 0 | 0.0% | 3 | 10.0% | | |
| **Conjunctiva abnormalities** | Negative | 28 | 93.3% | 19 | 63.3% | 7.954 | **0.005** |
| | Positive | 2 | 6.7% | 11 | 36.7% | | |
| · Conjunctiva calcification | Negative | 30 | 100% | 26 | 86.7% | 4.286 | **0.038** |
| | Positive | 0 | 0.0% | 4 | 13.3% | | |
| · Conjunctiva vacuoles | Negative | 30 | 100.0% | 28 | 93.3% | 2.069 | 0.150 |
| | Positive | 0 | 0.0% | 2 | 6.7% | | |
| · Conjunctiva pigmentation | Negative | 30 | 100.0% | 26 | 86.7% | 4.286 | **0.038** |
| | Positive | 0 | 0.0% | 4 | 13.3% | | |
| · Follicular conjunctivitis | Negative | 28 | 93.3% | 29 | 96.7% | 0.351 | 0.554 |
| | Positive | 2 | 6.7% | 1 | 3.3% | | |
| **Corneal abnormalities** | Negative | 30 | 100.0% | 25 | 83.3% | 5.455 | **0.020** |
| · Corneal calcification | positive | 0 | 0.0% | 5 | 16.7% | | |
| · Corneal vasculature | Negative | 30 | 100.0% | 29 | 96.7% | 5.455 | **0.020** |
| | Positive | 0 | 100.0% | 1 | 3.3% | | |
| **Fundus changes** | Normal | 30 | 100.0% | 26 | 86.7% | 4.286 | **0.038** |
| | Abnormal | 0 | 0.0% | **4** | **13.3%** | | |
| · Intra-retinal Hge | Negative | 30 | 100.0% | 27 | 90% | 3.158 | 0.076 |
| | Positive | 0 | 0.0% | **3** | **10%** | | |
| · Myopic fundus | Negative | 30 | 100.0% | 29 | 96.7% | 2.069 | 0.150 |
| | Positive | 0 | 0.0% | 1 | 3.3% | | |

**Table 5.** The relation between tortuous ocular blood vessels with duration of hemodialysis and serum creatinine level in children on regular hemodialysis.

| Variable | | Tortuous vessels | | t | P |
|---|---|---|---|---|---|
| | | Negative | Positive | | |
| **Duration of hemodialysis (years)** | **Median (IQR)** | 4 (2 - 5) | 7 (7 - 13) | −2.628‡ | **0.009** |
| **Creatinine Level** | **Mean ±SD** | 7.80 ± 1.95 | 10.77 ± 1.61 | −2.533• | **0.017** |

‡: Mann Whitney test. •: Independent t-test.

**Table 6.** Frequency of ocular findings in the study patients group.

| Variable | No (30) | % (100) |
|---|---|---|
| V/A changes | 20 | 66.7% |
| Corneal calcification | 5 | 16.7% |
| Conjunctiva calcification | 4 | 13.3% |
| Fundus changes | 4 | 13.3% |
| Lens abnormalities | 2 | 6.7% |
| IOP changes | 2 | 6.7% |

IOP :intraocular pressure.

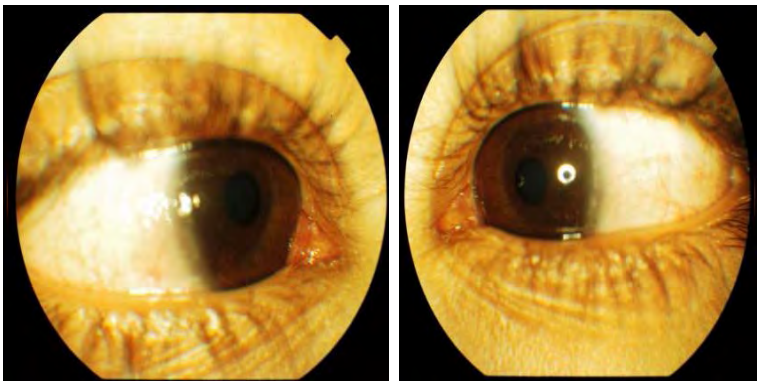

**Figure 1.** Corneal and conjunctival calcification of both eyes in one of the study patients group.

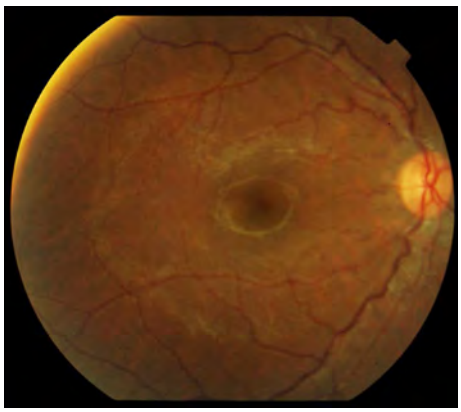

**Figure 2.** Retinal hemorrhage in one of the study patients group.

## 4. Discussion

Several studies in adult population have reported a sudden and severe decrease in visual acuity in patients on hemodialysis [8], while studies that evaluate this issue in a pediatric population with ESRD are generally deficient.

In the present study we evaluated visual acuity disorders and the degree of visual acuity in a group of Egyptian children on regular hemodialysis in comparison to their healthy controls, it showed significant increase in visual acuity disorders in hemodialysis children with significant decrease in the degree of visual acuity in 60%, 73% in both right and left eye respectively in hemodialysis patients in comparison to 13.3% in either eyes among controls detected by Landolt's broken ring chart. Patients with CKD are more likely to suffer from visual impairment than without CKD [9].

Hemodialysis (HD) patients often complain of both acute and chronic vision changes. Decreased vision in CKD patients hampers daily activities, with increased incidence of falls and difficulty in performing personal tasks [10].

Acute changes could be secondary to changes in parameters during HD as rapid shifts of body fluid, abrupt changes of glycemic control and retraction of macular edema [8], but chronic changes most often result from eye disease secondary to the primary cause of renal insufficiency e.g. hypertension [5].

Visual acuity depends on the health of the cornea, lens, and retina, all of which are prone to change during HD [11].

This study showed that corneal and conjunctival calcification was reported in 16.7%, 13.3% respectively of the study patients group in comparison to zero% in their controls. Common ocular surface findings in hemodialysis patients are corneal and conjunctival calcifications, which sometimes leads to red eye and squamous metaplasia [12], the calcific deposits have been shown histologically to be calcium phosphate. Precipitation of calcium salts is assumed to occur when serum concentrations of calcium and phosphate exceed solubility [13].

Uraemic toxins were reported to cause endothelial damage leading to polymegathism and pleomorphism in patients with chronic kidney disease [14] [15]. *Anbar et al.*; *Akinic et al.* [16] [17], reported that conjunctival and corneal deposits were detected in 3 (15.7%) patients of children with CKD. However, ocular surface changes, mainly squamous metaplasia of the conjunctival epithelium, may develop in patients with ESRF undergoing hemodialysis in adult [18] [19] [20].

The present study revealed low mean values of Wt, Ht and BMI z scores among CKD patients in comparison to healthy controls.; patients on chronic dialysis and especially children are malnourished, which reflects the state of vitamins and minerals deficiency which play a golden role in all organ functions including the eye [21].

This study showed that only 2 patients (6.7%) have lens abnormalities, one patient had Lt posterior subcapsular opacity and the other had bilateral pseudophilic lens. Urea trapping in the lens causes chronic water accumulation within

the lens, ultimately leading to an osmotic cataract, once patients are on chronic dialysis, intermittent fluxes of fluid into and out of the lens may also lead to chronic changes in the lens with cataract formation [22]. Also oxidative stress in CKD patients may lead to carbamylation of lens proteins, a process that has been suggested to cause cataract [23]. Akinic *et al.* [17] reported a similar finding.

Regarding the fundus of the eye examination, this study reported that, 4 patients (13.3%) developed fundus abnormalities, 3 patients (10%) had intraretinal Hge and only one patient (3.3%) had myopic fundus, meanwhile the most detected retinal microvasculature abnormalities were congested vessels (33.3%) then hyperemic disc (16.7%) followed by attenuated arteries (13.3%).

Generalized retinal arteriolar narrowing typically reflects permanent or persistent damage usually from atherosclerosis or longstanding hypertension [24]. The possible explanation for the retinopathy-kidney link might be: retinal microvascular abnormalities resulting from, hypertension, inflammation and other process may provide a common pathophysiologic link for the development and progression of CKD [25].

Gao *et al.* [25] reported that high prevalence of ocular fundus abnormalities in CKD patients, these data originate solely in adult patients.

The duration of hemodialysis and serum creatinine levels were the only related factor that seems to affect the blood vessels tortuosity among the study patients group. This was consistent with [17] who reported that the duration of the disease seems to be the major disease-related factor affecting ocular changes.

## 5. Conclusion

Eye and visual abnormalities are not uncommon in children on hemodialysis. So regular follow up and visual rehabilitation will be beneficial in these patients to improve their quality of life.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

[1] Delles, C. and Vanholder, R. (2017) Chronic Kidney Disease. *Clinical Science*, **131**, 225-226. https://doi.org/10.1042/CS20160624

[2] Alaygut, D., Torun-Bayram, M., Soylu, A., Kasap, B., Turkman, M. and Kavukcu, S. (2013) Chronic Kidney Disease in an Adolescent with Hyperuricemia: Familial Juvenile Hyperuricemic Nephropathy. *The Turkish Journal of Pediatrics*, **55**, 637-640.

[3] Nakata, M., Okada, Y., Kobata, H., Shigematsu, T., Reinach, P.S., Tomoyose, K. and Saika, S. (2014) Diabetes Mellitus Suppresses Hemodialysis-Induced Increases in Tear Fluid Secretion. *BMC Research Notes*, **7**, 78. https://doi.org/10.1186/1756-0500-7-78

[4] Aktaş, S., Sağdık, H.M., Aktaş, H., Gülcan, E., Tetikoğlu, M., Coşgun, S., Çalışkan, S. and Özcura, F. (2015) Tear Function in Patients with Chronic Renal Failure Un-

dergoing Hemodialysis. *Renal Failure*, **37**, 245-248. https://doi.org/10.3109/0886022X.2014.982487

[5] Ghasemi, H., Afshar, R., Zerafatjou, N., *et al.* (2012) Impact of Hemodialysis on Visual Parameters in Patients with End-Stage Renal Disease. *Iranian Journal of Kidney Diseases*, **6**, 457-463.

[6] KDIGO (2012) KDIGO Clinical Practice Guideline for Anemia in Chronic Kidney Disease. *Kidney International Supplements*, **2**, 283-287.

[7] Kaiser, P.K. (2009) Prospective Evaluation of Visual Acuity Assessment: A Comparison of Snellen versus ETDRS Charts in Clinical Practice. *Transactions of the American Ophthalmological Society*, **107**, 311-324.

[8] Stoffelns, B.M. and Richard, G. (2010) Is Buckle Surgery Still the State of the Art for Retinal Detachments Due to Retinal Dialysis? *Journal of Pediatric Ophthalmology and Strabismus*, **47**, 281-287. https://doi.org/10.3928/01913913-20091019-10

[9] Wong, T.Y., Klein, R., Sharrett, A.R., Manolio, T.A., Hubbard, L.D., Marino, E.K., *et al.* (2003) The Prevalence and Risk Factors of Retinal Microvascular Abnormalities in Older Persons. *Ophthalmology*, **110**, 658-666. https://doi.org/10.1016/S0161-6420(02)01931-0

[10] Dahal, P. and Gouli, S. (2014) Ocular Findings in the Chronic Renal Failure. *Journal of College of Medical Sciences-Nepal*, **10**, 18-24. https://doi.org/10.3126/jcmsn.v10i2.12949

[11] Chelala, E., Dirani, A., Fadlallah, A., Slim, E., Abdelmassih, Y., Fakhoury, H., *et al.* (2015) Effect of Hemodialysis on Visual Acuity, Intraocular Pressure and Macular Thickness in Patients with Chronic Kidney Disease. *Clinical Ophthalmology*, **9**, 109-114. https://doi.org/10.2147/OPTH.S74481

[12] Türkcü, F.M., Türkcü, G., Temiz, G., Yüksel, H., Taş, M. and Tunç, N. (2014) Ocular Surface Findings in Chronic Renal Failure *European Journal of General Medicine*, **11**, 148-152. https://doi.org/10.15197/sabad.1.11.60

[13] Sun, W., Sun, M., Zhang, M., Liu, Y., Lin, X., Zhao, S. and Ma, L. (2015) Correlation between Conjunctival and Corneal Calcification and Cardiovascular Calcification in Patients Undergoing Maintenance Hemodialysis. *Hemodialysis International*, **19**, 270-278. https://doi.org/10.1111/hdi.12236

[14] Diaz-Couchoud, P., Bordas, F., Garcia, J., Camps, E. and Carceller, A. (2001) Corneal Disease in Patients with Chronic Renal Insufficiency Undergoing Hemodialysis. *Cornea*, **20**, 695-702. https://doi.org/10.1097/00003226-200110000-00005

[15] Oghuro, N., Matsuda, M. and Fukuda, M. (1999) Corneal Endothelial Changes in Patients with Chronic Renal Failure. *American Journal of Ophthalmology*, **128**, 234-236. https://doi.org/10.1016/S0002-9394(99)00086-0

[16] Anbar, M., Ahmed, A.R.H., El-Mazary, A.-A.M. and Mahmoud, R.A. (2016) Ocular Surface Disorders in a Group of Egyptian Children with End Stage Renal Failure on Dialysis: A Cross-Sectional Study. *Journal of Ophthalmology*, **2016**, Article ID: 4767819. https://doi.org/10.1155/2016/4767819

[17] Akinci, A., Cakar, N., Kara, N. and Uncu, N. (2009) Ocular Findings in Children with Chronic Renal Failure. *Cornea*, **28**, 5-6. https://doi.org/10.1097/ICO.0b013e318181f9f0

[18] Vrabec, R., Vatavuk, Z., Pavlovi´c, D., Sesar, A., Cala, S., Mandić, K. and Bućan, K. (2005) Ocular Findings in Patients with Chronic Renal Failure Undergoing Haemodialysis. *Collegium Antropologicum*, **29**, 95-98.

[19] Dursun, D., Demirhan, B., Oto, S. and Aydin, P. (2000) Impression Cytology of the

Conjunctival Epithelium in Patients with Chronic Renal Failure. *British Journal of Ophthalmology*, **84**, 1225-1227. https://doi.org/10.1136/bjo.84.11.1225

[20] Bakaris, S., Ozdemir, M., Isik, I.O., Buyukbese, M.A. and Ozdemir, G. (2005) Impression Cytology Changes and Corneoconjunctival Calcification in Patients with Chronic Renal Failure. *Acta Cytologica*, **49**, 1-6. https://doi.org/10.1159/000326108

[21] Caffery, B. (1991) Influence of Diet on Tear Function. *Optometry and Vision Science*, **68**, 58-72. https://doi.org/10.1097/00006324-199101000-00010

[22] Evans, R.D. and Rosner, M. (2005) Fellows' Forum: Ocular Abnormalities Associated with Advanced Kidney Disease and Hemodialysis. *Seminars in Dialysis*, **18**, 252-257. https://doi.org/10.1111/j.1525-139X.2005.18322.x

[23] Klein, B.E.K., Knudtson, M.D., Brazy, P., *et al.* (2008) Cystatin C, Other Markers of Kidney Disease, and Incidence of Age-Related Cataract. *Archives of Ophthalmology*, **126**, 1724-1730. https://doi.org/10.1001/archophthalmol.2008.502

[24] Ooi, Q.L., Tow, F.K., Deva, R., Alias, M.A., Kawasaki, R., Wong, T.Y., *et al.* (2011) The Systemic Microvasculature in Chronic Kidney Disease. *Clinical Journal of the American Society of Nephrology*, **6**, 1872-1878. https://doi.org/10.2215/CJN.10291110

[25] Gao, B., Zhu, L., Pan, Y., Yang, S., Zhang, L. and Wang, H. (2011) Ocular Fundus Pathology and Chronic Kidney Disease in a Chinese Population. *BMC Nephrology*, **12**, 62. https://doi.org/10.1186/1471-2369-12-62

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# Effect of the Mediterranean Diet on BMI in Middle-Aged Hispanic Women with Pre-Obesity and Obesity Central Washington State

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## Abstract

**Background:** Conclusive evidence has yet to emerge regarding the effectiveness and applicability of the Mediterranean diet on middle-aged Hispanic women, the largest female minority group in the United States who is at-risk of metabolic disorders. **Objective:** The aim of this study is to evaluate the effect of the Mediterranean diet (MED) on the BMI in middle-aged Hispanic women with pre-obesity and obesity in Central Washington State. **Design:** A prospective study was performed to determine the effect of Mediterranean diet on the BMI of 67 Hispanic women with pre-obesity and obesity between 45 to 65 years of age in Central Washington State. The study was carried out for eight weeks. Dietary adherence was monitored to ensure consistent results. **Results:** The proportion of Hispanic women who reported a reduction in BMI was 94%, with a decrease in mean BMI after eight weeks of 2.8 (95% CI: 2.5 to 3.0) and P = 0.02, with an odds ratio of 2.6. Multiple linear regression analysis was used to adjust for age, education, physical activity, and smoking. **Conclusion:** The reduction in BMI demonstrates that the Mediterranean diet can be a promising, culturally appropriate therapy to address the obesity epidemic that is prevalent among Hispanic women.

## Keywords

Obesity, Hispanics, Public Health, Mediterranean Diet, Chronic Disease, Metabolic Disorders, Diabetes Type 2, Coronary Heart Disease, Primary Prevention

## 1. Introduction

Obesity is a risk factor for the two leading causes of death in the United States

and the second leading cause of preventable death worldwide [1]. Classified as a chronic disease by Medicare in 2004, obesity is considered one of the most prevalent, costly, and preventable medical problems in the United States [2]. Over 50% of the population in rural areas of Central Washington State is characterized as Hispanic [3]. Despite being the largest, fastest-growing female minority group in the U.S., Hispanic women (Latinas) report higher rates of pre-obesity (BMI: 25 - 29.9 kg/m$^2$), obesity (BMI ≥ 30 kg/m$^2$), and metabolic disorders [3] [4] [5]. With low-income, limited access to basic medical services, and high uninsured rates, Latinas in Central Washington State are a vulnerable population that creates great economic and public health burden in the country [6]. Studies confirm that a proper diet is an important component in the prevention and management of obesity. Previous studies on Mediterranean diet (MED) have focused on the anti-inflammatory and neurocognitive effect on non-Hispanic populations but have not determined its effectiveness and applicability on middle-aged Latinas in Central Washington State, which is an underserved population [7] [8]. The aim of this study is to examine the effect of the Mediterranean diet on the body mass indices (BMIs) in middle-aged Hispanic women with pre-obesity and obesity in Central Washington State.

## 2. Methods

### 2.1. Description of Diet

A cohort of 67 middle-aged Hispanic women was recruited with pre-obesity (BMI of 25 - 29 kg/m$^2$) and obesity (BMI of ≥30 kg/m$^2$) and was placed on the Mediterranean diet for eight weeks. The low rates of coronary heart disease in the Mediterranean countries stimulated interest in the metabolic health benefits of this diet [9]. The important components of this lifestyle include a high polyphenol and fiber content, a rich variety of fruits and vegetables, healthy protein sources, and polyunsaturated fatty acids (**Figure 1** and **Table 1**). It is important to understand that the Mediterranean diet is a way of eating, not simply a compendium of recipes. Many observational studies show decreased rates in diabetes type 2, obesity, and cardiovascular disease in individuals adhering to a Mediterranean diet [10].

### 2.2. Sample Description

The population of interest consisted of all Hispanic women with pre-obesity or obesity, living in Central Washington State. **Table 2** includes the eligibility criteria for both inclusion and exclusion of participants in the study. Passive recruiting methods were employed to enroll the participants through television announcements in local channels seen in the Northwest United States. Interviews were conducted on 83 responders, 16 were disqualified, based on the selection criteria (**Table 2**), thus 67 participants were integrated into the study. A probability sampling technique, known as stratified sampling, was employed to ensure adequate representation of females within the middle-aged range. *Target Sample*


**Figure 1.** Mediterranean diet pyramid (center). Food groups (right) and servings (left).

**Table 1.** Mediterranean diet.

| Food Component | Example | Servings | Clinical Features |
|---|---|---|---|
| Whole grain cereals, legumes | Brown rice, wheat, beans | 2 - 3 per day | Fiber-rich; associated with early satiety and reduced obesity [11] |
| Vegetables, fruits | Apples, green leafy vegetables | 3 - 4 per day | Antioxidant-rich; associated with reduced cellular damage [12] |
| Fish | Salmon, cod, tuna | 3 - 4 per week | Omega 3-rich; associated with improved cardiovascular health and reduced mortality [13] |
| Poultry, eggs, dairy, meat | Chicken, yogurt, beef | 1 - 2 per week | Rich sources of amino acids and saturated fats |

**Table 2.** Selection criteria.

| Inclusion Criteria | Example |
|---|---|
| Demographic Characteristics | Hispanic women 45 to 65 years of age |
| Geographic Characteristics | Living in Central Washington State |
| Clinical Characteristics | BMI ≥ 25 |
| Temporal Characteristics | From Jan 25 to March 25, 2019 |
| **Exclusion Criteria** | **Example** |
| Demographic Characteristics | Younger than 45 or older than 65 years of age |
| Geographic Characteristics | Living outside Central Washington State |
| Clinical Characteristics | History of bariatric surgery, on weight loss pharmacotherapy, or BMI < 25 |

*Size*. The statistical power calculation was computed to detect the minimum difference between the means in BMI. To have a 90% probability of detecting a 4-point difference in BMIs (in $kg/m^2$), at least 66 participants needed to be

enrolled, assuming an overall standard deviation in BMI scores of 10 points and a one-tailed alpha-level of 5%.

## 2.3. Procedures

Anthropometric measures were obtained (using Health O Meter Professional scale), which included weight and height. Body Mass Index (BMI) was calculated as kilograms divided by meters squared. BMI is a recommended standardized marker of obesity because it is independent of variables, such as ethnicity and sex [14]. A trained research assistant weighted and measured women by using standardized procedures shown in Table 3. At the beginning of the study, the subjects received a nutritional assessment questionnaire (**Appendix A**), which included nutritional and dietary history, physical activity evaluation, weight history, weight loss pharmacotherapy history, surgical procedure history, and screening for motivational level to complete the program. Evaluation tools, including 24-hour dietary recall and food frequency questionnaires (**Appendix B**), were implemented at the end of each week, to enhance awareness of eating patterns and to measure adherence level. Group support programs were conducted every week, to promote stronger adherence with the dietary regimen. Written consent forms were obtained from all women in either Spanish or English prior to the study. The consent forms and recruitment script were carefully designed to avoid excessive information and reduce response bias.

*Missing Cases.* Two of the 67 participants dropped out during the eight-week study (attrition rate = 2.9%). The data of these participants was included as part of the final analysis, to reduce the likelihood of migration bias.

## 2.4. Screening for Covariates

This study examined for socio-demographic confounders that may impact BMI, such as age, education, smoking, and physical activity level. Multiple linear regression model was used to analyze the outcome variable and odds ratio to measure the association between exposure (e.g., following the MED) and the outcome (e.g., reduction in BMI).

## 2.5. Analysis

This study compared the difference in means between the BMI before and after the MED administration. The statistical significance of the difference in means of BMI was assessed using the t-test. A one-sided (lower-tailed) t-test was selected with the alpha level set at 0.05. The lower-tailed result was of interest, because only a reduction in BMI in individuals with pre-obesity and obesity is clinically meaningful. Next, multivariable linear regression analysis was used to adjust for the effects of potential confounders, such as age (as a continuous variable), education, smoking, and physical activity (as dichotomous variables), respectively (Table 4). All statistical analyses were conducted in 2019 with IBM SPSS Statistics, version 24.0. The t-test statistics were one-sided and statistical significance was defined as $P < 0.05$.

**Table 3.** Standardization.

| Methods | Source of Random Error | Example of Strategy |
|---|---|---|
| Measurement methods | Observer | Assigned a trained assistant to obtain BMIs |
| | Subject | Specified participants to remove heavy clothing |
| Refining the instrument | Instrument | Properly calibrate the scale prior to the study |
| Repeating the measurement | Observer, Subject, and Instrument | Used the mean of two or more BMI readings |

**Table 4.** Multiple regression analysis.

| Independent Variables | Coefficient ($\beta$) | Standard Error | t Stat | P-value |
|---|---|---|---|---|
| Intercept | 18.66 | 2.56 | 7.28 | <0.001 |
| Age | 0.13 | 0.04 | 2.80 | 0.006* |
| Smoking | −0.19 | 0.89 | −0.21 | 0.83 |
| Exercise | 0.39 | 0.94 | 0.41 | 0.68 |
| Education | −0.02 | 0.75 | −0.02 | 0.97 |

*The greatest magnitude of association of all the independent variables.

## 3. Results

### 3.1. Socio-Demographic Characteristics

A cohort of 67 middle-aged Hispanic women were recruited with pre-obesity and obesity and were placed on the Mediterranean diet for eight weeks. The participants self-reported to adhere to the Standard American Diet (SAD) before the study. The summary statistics for this study are presented in Table 5. Most women were from Mexican origin (81%) and the remainder from Central and South America (19%). The classification of Hispanic ethnicity was according to the U.S. Department of Health and Human Services Office of Minority Health (2008) [15]. The mean age was 53.3 (SD = 6.3; range = 45 - 65). Occupation during the study was as follows: field workers, 65.2%; factory workers, 20.4%; housekeeping, 9.3%; daycare, 2.6%; other, 2.5%. Most women reported Spanish as their primary language (97.7%; English, 2.3%). Most women reported no education (17.3% reported High School education). Physical activity was evaluated using the minimum guidelines for adults, according to the Office of Disease Prevention and Health Promotion (150 minutes per week). Only 10% of subjects reported meeting the minimum guidelines for physical activity.

### 3.2. Main Finding

Of the 67 Hispanic women that were enrolled in this cohort study with pre-obesity and obesity, 94% demonstrated a reduction in BMI, with no participant reporting increases. During the eight-week follow up period on the MED, the mean BMI reduction was 2.8 (95% confidence interval: 2.5 to 3.0; P = 0.02) in middle-aged Latinas (n = 67), with an odds ratio of 2.6. At the beginning of

Table 5. Summary statistics.

| Variable | Description | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|---|
| Age | Years | 45 | 65 | 53.3 | 6.3 |
| BMI (before) | Kg/m | 25.1 | 34.8 | 28.5 | 2.4 |
| BMI (after) | Kg/m | 22.1 | 32.9 | 25.7 | 2.4 |
| Smoke* | Yes/No | | | 11% Yes | |
| Education (High School) | Yes/No | | | 17.3% Yes | |
| Exercise** | Yes/No | | | 10% Yes | |
| Annual Household Income | US Dollars | 25,000 | 40,345 | 30,158 | 3,367 |

**Defined as the minimum guidelines for adults, according to the Office of Disease Prevention and Health Promotion (150 minutes per week).

the study, most of the participants had pre-obesity (71%) and the remaining obesity (29%). At the end of the eight-week interval, a group (51%) of Hispanic women who had previous pre-obesity, reported a BMI within a normal range. Figure 2 shows the change of BMI in each individual participant before and after the eight weeks on the Mediterranean diet. Because the P-value achieved was 0.02, the null hypothesis, which stated that there was no change in means of BMIs, was rejected. After adjusting for age, physical activity, smoking, and education, the results remained consistent. The higher the adherence to the MED, the higher the likelihood of BMI reduction is. Adherence to the MED was measured via a questionnaire (see **Appendix B**), where subjects would give themselves a score based on the frequency of Mediterranean food servings, they had that week. Thus, adherence level was inversely related to BMI. Subjects reported having more difficulty adhering to the diet during the first week of the program. The subjects who experienced more dramatic reductions in BMIs reported higher motivation to continue this diet as a way of life. Whether weight reduction was defined using BMI or waist-to-hip ratio, the results were similar. Thus, MED was a positive moderator of BMI. Adjusting for age, physical activity levels, education, and smoking status using multiple linear regression analysis did not affect these results. Whether a manual professional-grade weight scale or a digital scale was used, the results were consistent throughout the study.

## 4. Discussion

A nonpharmacologic intervention to reduce the body mass index in Hispanic women with pre-obesity and obesity resulted in improved weight status and quality of life. When compared to their previous body mass indices (BMIs) before starting the MED, 94% of them experienced a significant reduction in BMI following the diet. The decrease in weight is associated with a 2.8 mean reduction in BMI. These findings may have important public health and clinical implications, since Hispanic women are at risk of obesity-related complications, such as ischemic heart disease, diabetes type 2, cancer, cerebrovascular disease,

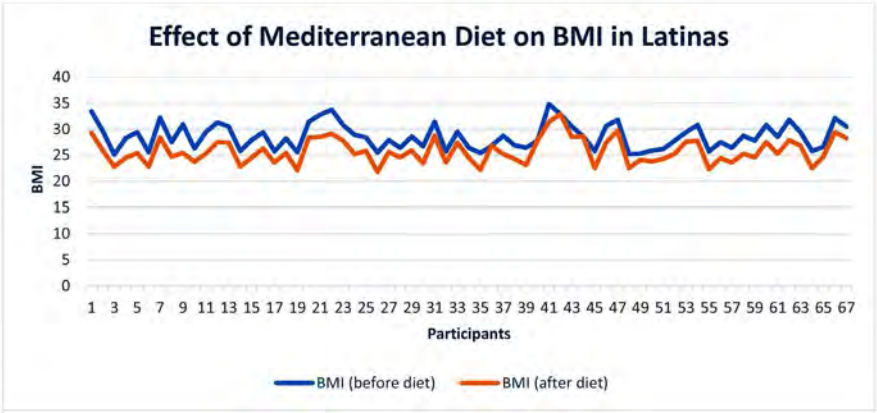


**Figure 2.** Body Mass Index change in each of the participants (n = 67) during the eight weeks on the Mediterranean diet.

and premature death, creating a great economic burden [16]. Hispanics tend to have less access to scheduled healthcare services, decreased medical compliance, and are twice as likely to visit the emergency room as the general population [17]. Because Hispanics have the highest uninsured rates in the U.S. and most of them belong to low-income families, an emphasis on prevention can yield greater health benefits for this rapidly growing population. Food plays a central role that accounts for the high prevalence of obesity, hypertension, and diabetes, among Hispanics [18]. Thus, early detection of poor lifestyle habits, such as an obesity-promoting diet, should be addressed diligently, which will allow more time to plan and monitor the progress of patients. These results indicate that clinicians should consider the use of the MED with their Hispanic patients, as an effective primary prevention strategy to improve their BMIs. Clinical studies demonstrate the linear relationship that exists between systolic blood pressure and BMI, and that having a BMI lower than 25 $kg/m^2$ is a promising primary prevention strategy in addressing hypertension [19]. Thus, implementing the Mediterranean diet, as a positive moderator of BMI, may be effective in the prevention and management of chronic diseases.

In addition, this study found that the improvement in quality of life was greatest in those who reported stronger adherence to the Mediterranean diet. One possible explanation for this result is that the MED is rich in anti-inflammatory and antioxidant phytonutrients, which help decrease the low-grade, systemic inflammation in individuals with obesity [20]. Thus, the decrease in inflammatory burden and oxidative stress results in systemic improvement in physiology and metabolic function. The Mediterranean diet provides a dietary basis that corrects many of the pathophysiologic mechanisms of obesity, diabetes type 2, and coronary heart disease [21].

Although other research studies have underscored the health-promoting benefits of the MED, this study adds the practicality and efficacy of this nutritional therapy in working with the Hispanic population. Prompt action from clinicians and health professionals is needed to address obesity in Hispanics, since pedia-

tric obesity is also higher among Hispanics [22]. Unless aggressive preventive measures and policies are set in motion, this generational obesity-gradient will continue to devastate many lives, strengthen racial/ethnic disparities, and increase healthcare cost. Most Hispanic women with pre-obesity and obesity have serious weight-related medical problems, thus addressing the obesity epidemic among Hispanic women and minorities in general should be America's number one public health priority.

While the sample size of this study was one of the main limitations, this study had five major strengths. First, the sample was representative of the general Hispanic population in the United States, which is characterized by low socioeconomic status. Second, the completion rate of the nutrition program by the subjects was high. Third, adjustment for potential confounders was performed to ensure the validity of the results. Fourth, the study is recent and reflects current health behavior trends in regions with high density of Hispanics. Finally, this study confirms that it is possible to achieve significant changes in BMI in a short period of time, by employing an interdisciplinary approach that includes social support and weekly nutritional assessments. The clinical and public health relevance of these findings are emphasized by the fact that lifestyle factors strongly influence the development of chronic diseases, thus promoting and educating underserved populations can produce remarkable changes in the health of these individuals. By further exploring and promoting the health-enhancing benefits of the Mediterranean diet, health professionals and clinicians will continue to make important contributions to stop the obesity epidemic that is disproportionately affecting minorities and accentuating health disparities.

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## Data Share

Data described in this manuscript will be made publicly and freely available without restrictions at the URL indicated by this journal.

## Funding

No source of funding was involved that influenced the results of this study.

## Conflict of Interest

Author Eloy Espinoza, MD, MPH declares that he has no conflict of interest.

## Ethical Approval

All procedures performed in this study were done in accordance and acceptance with the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## Informed Consent

Informed consent was obtained from all individual participants included in this study.

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## References

[1] Centers for Disease Control and Prevention (2016) Deaths: Leading Causes for 2016. https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm.

[2] Cawley, J. and Meyerhoefer, C. (2012) The Medical Care Costs of Obesity: An Instrumental Variables Approach. *Journal of Health Economics*, **31**, 219-230. https://doi.org/10.1016/j.jhealeco.2011.10.003

[3] U.S. Census Bureau (2010) Hispanics in Washington State. http://www.census.gov.libweb.ben.edu/2010census/

[4] Hales, C.M., Carroll, M.D., Fryar, C.D. and Ogden, C.L. (2017) Prevalence of Obesity among Adults and Youth: United States, 2015-2016. NCHS Data Brief; No. 288. National Center for Health Statistics, Hyattsville, MD.

[5] Daviglus, M.L., Talavera, G.A., Avilés-Santa, M.L., Allison, M., Cai, J., *et al.* (2012) Prevalence of Major Cardiovascular Risk Factors and Cardiovascular Diseases among Hispanic/Latino Individuals of Diverse Backgrounds in the United States. *Journal of the American Medical Association*, **308**, 1775-1784. https://doi.org/10.1001/jama.2012.14517

[6] ASPE (2011) Overview of the Uninsured in the United States: A Summary of the 2011 Current Population Survey. https://aspe.hhs.gov/basic-report/overview-uninsured-united-states-summary-2011-current-population-survey.

[7] Ahmad, S., Moorthy, M.V., Demler, O.V., Hu, F.B., Ridker, P.M., Chasman, D.I., *et al.* (2018) Assessment of Risk Factors and Biomarkers Associated With Risk of Cardiovascular Disease among Women Consuming a Mediterranean Diet. *JAMA Network Open*, **1**, e185708. https://doi.org/10.1001/jamanetworkopen.2018.5708

[8] Voelker, R. (2018) The Mediterranean Diet's Fight against Frailty. *Journal of the American Medical Association*, **319**, 1971-1972. https://doi.org/10.1001/jama.2018.3653

[9] Nordmann, A.J., Suter-Zimmermann, K., Bucher, H.C., Shai, I., Tuttle, K.R., Estruch, R., *et al.* (2011) Meta-Analysis Comparing Mediterranean to Low-Fat Diets for Modification of Cardiovascular Risk Factors. *The American Journal of Medicine*, **124**, 841-851. https://doi.org/10.1016/j.amjmed.2011.04.024

[10] Eguaras, S., Toledo, E., Hernandez-Hernandez, A., Cervantes, S. and Martinez-Gonzalez, M.A. (2015) Better Adherence to the Mediterranean Diet Could Mitigate the Adverse Consequences of Obesity on Cardiovascular Disease: The SUN Prospective Cohort. *Nutrients*, **7**, 9154-9162. https://doi.org/10.3390/nu7115457

[11] Howarth, N.C., Saltzman, E. and Roberts, S.B. (2001) Dietary Fiber and Weight

Regulation. *Nutrition Reviews*, **59**, 129-139. https://doi.org/10.1111/j.1753-4887.2001.tb07001.x

[12] van Poppel, G., Verhoeven, D.T., Verhagen, H. and Goldbohm, R.A. (1999) Brassica vegetables and Cancer Prevention. *Advances in Experimental Medicine and Biology*, **472**, 159-168. https://doi.org/10.1007/978-1-4757-3230-6_14

[13] de Lorgeril, M., Salen, P., Martin, J.L., Monjaud, I., Delaye, J. and Mamelle, N. (1999) Mediterranean Diet, Traditional Risk Factors, and the Rate of Cardiovascular Complications after Myocardial Infarction: Final Report of the Lyon Diet Heart Study. *Circulation*, **99**, 779-785. https://doi.org/10.1161/01.CIR.99.6.779

[14] Jackson, A., Standorth, P.R., Gagnon. J., Rankinen. T., Leon, A.S., Rao, D.C., *et al.* (2002) The Effect of Sex, Age, and Race on Estimating Percentage Body Fat from Body Mass Index: The Heritage Family Study. *International Journal of Obesity*, **26**, 789-796. https://doi.org/10.1038/sj.ijo.0802006

[15] US Department of Health and Human Services, Office of Minority Health (2008). https://minorityhealth.hhs.gov/omh/browse.aspx?lvl=3&lvlid=64.

[16] Hunt, K.J., Resendez, R.G., Williams, K., *et al.* (2003) All-Cause and Cardiovascular Mortality among Mexican American and Non-Hispanic White Older Participants in the San Antonio Heart Study—Evidence against the "Hispanic Paradox." *American Journal of Epidemiology*, **158**, 1048-1057. https://doi.org/10.1093/aje/kwg249

[17] Diaz Jr., V.A. (2002) Cultural Factors in Preventive Care: Latinos. *Primary Care: Clinics in Office*, **29**, 503-517. https://doi.org/10.1016/S0095-4543(02)00010-6

[18] Sharma, S. and Cruickshank, J.K. (2001) Cultural Differences in Assessing Dietary Intake and Providing Relevant Dietary Information to British, African-Caribbean Populations. *Journal of Human Nutrition and Dietetics*, **14**, 449-456. https://doi.org/10.1046/j.1365-277X.2001.00319.x

[19] Casas, R., Sacanella, E. and Estruch, R. (2014) The Immune Protective Effect of the Mediterranean Diet against Chronic Low-Grade Inflammatory Diseases. *Endocrine, Metabolic & Immune Disorders—Drug Targets*, **14**, 245-254. https://doi.org/10.2174/1871530314666140922153350

[20] Stevens, V.J., Obarzanek. E., Cook. N.R., Lee, I.-M., Appel, L.J., West, D.S., *et al.* (2001) Long-Term Weight Loss and Changes in Blood Pressure: Results of the Trials of Hypertension Prevention, Phase II. *Annals of Internal Medicine*, **134**, 1-11. https://doi.org/10.7326/0003-4819-134-1-200101020-00007

[21] Salas-Salvado, J., Bullo, M., Estruch. R., Ros, E., Covas, M.-I., Ibarrola-Jurado, N., *et al.* (2014) Prevention of Diabetes with Mediterranean Diets: A Subgroup Analysis of a Randomized Trial. *Annals of Internal Medicine*, **160**, 1-10. https://doi.org/10.7326/M13-1725

[22] Skinner, A.C. and Skelton, J.A. (2014) Prevalence and Trends in Obesity and Severe Obesity among Children in the United States, 1999-2012. *JAMA Pediatrics*, **168**, 561-566. https://doi.org/10.1001/jamapediatrics.2014.21

## Appendix A: Mediterranean Diet Study Questionnaire

### Patient Information

Name: _____

Address: _____ Telephone: _____

Date of Birth: _____ Sex: _____ Weight (lbs.): _____

Height (ft): _____ BMI (Kg/m$^2$): _____

### Motivation Assessment

Please, indicate what you expect to obtain from this Mediterranean diet program:

weight management
improved overall health
look better
advice on proper nutrition
nothing
other: _____

On the scale of 1 to 10, what level of motivation do you have to start this Mediterranean diet program during the next eight weeks? (0 = not motivated, 10 = maximum motivation)

0 1 2 3 4 5 6 7 8 9 10

| Obesity History | Yes | No |
|---|---|---|
| 1) Has your doctor ever diagnosed you with pre-obesity or obesity? | | |
| 2) Has your doctor ever prescribed medication for obesity or pre-obesity? | | |
| 3) Have you ever had bariatric surgery? | | |
| 4) Have you ever had any cosmetic procedures for obesity (liposuction)? | | |
| 5) Have you ever had obesity-related complications (insulin resistance, obstructive sleep apnea, etc.)? | | |
| 6) Do you have conditions that promote obesity (hypothyroidism)? | | |
| 7) Are you taking medications that promote obesity (antipsychotics)? | | |
| 8) Has obesity impaired your activities of daily living (work, moving)? | | |
| 9) Has your doctor referred you to a registered dietician or nutritionist? | | |

### Intestinal Malabsorption

Do you have a history of gastro-intestinal tract problems? (e.g., gastritis, irritable bowel syndrome, stomach ulcers, food allergies or intolerances, colitis, Crohn's disease, etc.) If yes please describe, including type of treatment you are receiving:

_____

_____

_____

**Allergy History**

List any allergies you have (seasonal, food, or otherwise):

_____

_____

_____

**Stress valuation**

What level of stress do you routinely deal with? (0 = no stress, 10 = maximum stress)

0 1 2 3 4 5 6 7 8 9 10

**Nutritional Assessment**

The Mediterranean diet is rich in fruits, vegetables, and whole grain cereals; nuts and seeds are sources of fat, while legumes are fiber-rich sources of protein. The Mediterranean diet gives preference to fish and lean poultry, rather than red meat.

1) How often, on average, do you eat any of the following foods (*mark the food item that applies to you and circle the appropriate letter below*):

Turkey
Red meat
Chicken
Salmon

a) daily
b) most days of the week
c) 1 - 2 days of the week

2) How often, on average, do you consume any of the following foods:

Cheese and cow's milk
Almond milk
Coconut milk
Rice milk

a) daily
b) most days of the week
c) 1 - 2 days of the week

3) How often, on average, do you consume any of the following foods:

Green leafy vegetables
French fries
Extra virgin olive oil
Seeds and nuts (e.g., walnuts, pecans, sunflower seeds, etc.)

a) daily
b) most days of the week
c) 1 - 2 days of the week

4) How often, on average, do you consume any of the following foods:

Brown rice
White rice
Beans and lentils (e.g., garbanzo, etc.)
Oatmeal

a) daily
b) most days of the week
c) 1 - 2 days of the week

5) How often, on average, do you consume any of the following beverages:
Red wine

Beer
Soda
Fruit juice

a) daily
b) most days of the week
c) 1 - 2 days of the week

6) How often, on average, do you consume any of the following deserts:

Ice cream
Sweet cakes (e.g., brownies)
Dark chocolate
Dried fruit (e.g., dates, figs, etc.)

a) daily
b) most days of the week
c) 1 - 2 days of the week

7) How often, on average, do you consume any of the following snacks:
Gummi bears or hard candy

Nachos
Muffins
Celery sticks and baby carrots with sour cream

a) daily
b) most days of the week
c) 1 - 2 days of the week

### Environmental Exposures

| Exposure Type | Yes | No |
|---|---|---|
| Are you regularly exposed to second-hand smoke? | | |
| Do you smoke 1 or more cigarettes per week or chew or snuff tobacco? | | |
| Do you consume alcoholic beverages | | |
| Do you use recreational or medicinal marijuana | | |
| Do you use illegal drugs (e.g., amphetamines, cocaine, etc.) | | |
| Are you exposed to environmental pollutants at work? | | |
| Are you sitting down in front of a computer screen during the day? | | |
| Do you perform regular exercise (150 minutes per week or more)? | | |

### Vitamin and Supplements

List any nutritional and vitamin supplements you take (please include all vitamins, herbs, nutritional supplements for weight loss, energy enhancement, etc.):

_____

_____

_____

### Drug-Nutrient Interaction

| Do you take any of the following medications? | Yes | No |
|---|---|---|
| Laxatives | | |
| Cholesterol-lowering drugs (cholestyramine, fibrates, etc.) | | |
| Steroidal drugs (prednisone, methylprednisolone, cortisone) | | |
| Hormonal Replacement Therapy (estrogen, progesterone) | | |
| Antibiotics | | |
| Antidepressants | | |
| Nicotine | | |
| Anti-gout agents (colchicine, allopurinol, febuxostat) | | |
| Levothyroxine | | |
| Levo-Dopa | | |
| Anticonvulsants | | |
| Aspirin | | |
| Non-Steroidal Anti-Inflammatory Drugs (Naproxen, Ibuprofen, Diclofenac) | | |
| Caffeine | | |
| Antihypertensive drugs | | |
| Statin drugs (atorvastatin, simvastatin) | | |

Additionally, please indicate if any of the following health conditions apply to you.

__ Hemochromatosis __ Ulcerative Colitis __ Glucose-6-Phosphate Dehydrogenase Deficiency

__ Chronic Kidney Disease __ Crohn's Disease __ Diabetes

__ Gouty Arthritis __ Rheumatoid Arthritis __ Insulinoma __ Celiac Disease

__ Other: _____

**Future Expectations**

Which of the following statements concerning the Mediterranean diet best describes you?

a) I am not planning on following the Mediterranean diet after I complete this program

b) I have not decided whether I will follow the Mediterranean diet or not

c) I would like to integrate *some* food components of the Mediterranean diet

d) I am seriously going to continue with the *whole* Mediterranean diet as a lifestyle

By signing this questionnaire, I confirm that the information provided is accurate and reflects my eating pattern during this program.

Signature: _____ Date: _____

Thank you for participating in this Mediterranean diet study!

Eloy Espinoza, MD, MPH

## Appendix B: Mediterranean Diet Weekly Program Assessment Score

Give yourself a 1 for each "yes" and 0 for each "no"

| Food Item | Yes | No |
|---|---|---|
| **Fish:** I ate 3 - 4 servings this week | | |
| **Fruit:** I ate 3 - 4 servings every day this week | | |
| **Vegetables:** I ate 3 - 4 servings every day this week | | |
| **Whole grains:** I ate 1 - 3 servings every day this week | | |
| **Legumes:** I ate 1 - 3 servings every day this week | | |
| **Red meat:** I ate less than 1 or 2 servings every day this week | | |
| **Dairy:** I ate less than 1 - 2 servings every day this week | | |
| **Poultry/eggs**: I ate less than 1 - 2 servings every day this week | | |
| **Total:** | | |

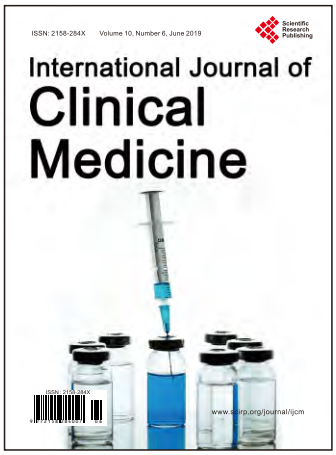
→ A total of 5 or more indicates *good* adherence to the diet and high likelihood of health benefit.

→ A total of less than 5 indicates *poor* adherence to the diet and lower likelihood of health benefit.

By signing this dietary assessment, I confirm that the information provided is accurate and reflects my eating pattern during this week in the program.
Signature: _____ Date: _____

Thank you for participating in this Mediterranean diet study!

Eloy Espinoza, MD, MPH

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