

Role of nutrition in rheumatic diseases

**An essay submitted in partial fulfilment of master degree
in
Physical Medicine, Rheumatology and Rehabilitation.**

Introduced by:

Yasmine Mohamed Abd El Nour
M.B., B.Ch. Faculty of Medicine, Ain Shams University.

Under supervision of

**Professor Doctor Fatma Kamel Mohammed Abdel
Motaal**

Professor of Physical Medicine, Rheumatology and
Rehabilitation
Faculty of Medicine, Ain Shams University

Professor Doctor Amal Mostafa El Ganzoury

Professor of Physical Medicine, Rheumatology and
Rehabilitation
Faculty of Medicine, Ain Shams University

Doctor Rana Ahmed El-Hilaly

Lecturer in Physical Medicine, Rheumatology and
Rehabilitation
Faculty of Medicine, Ain Shams University

Faculty of Medicine

Ain Shams University 2013

Introduction

Rheumatic disease is a type of disease involving inflammation of muscles, joints, and other tissues.

(Gale Encyclopedia of Medicine, 2008).

Millions of people suffer from rheumatic diseases such as gout, fibromyalgia, osteoarthritis, and rheumatoid arthritis. These can be incapacitating and detrimental to quality of life. Diet, nutrition, and weight loss have shown promise in alleviating some of this disease burden. These lifestyle changes may give patients a feeling of control and ownership over their disease as well as a nonpharmacologic means of treatment. (Li et al., 2010).

Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disease manifested by swollen and painful joints, bone erosion and functional impairment. The joint lesions are characterised by infiltration of T lymphocytes, macrophages and B lymphocytes into the synovium and by synovial inflammation involving eicosanoids, cytokines and matrix metalloproteinases (**Calder., 2008**).

Elimination diets may be useful in a subgroup of patients with rheumatoid arthritis, in whom food antigens probably play an important role in the onset and perpetuation of the inflammatory process. In mixed cryoglobulinemia a low-antigen-diet might reduce the amount of macromolecular food antigens which cross the mucosal barrier of the gut and cause either an immune response and/or compete with the immune complexes in the mononuclear phagocytic system. Supplementing the diet with essential fatty acids (omega-3 and/or omega-6) may inhibit the production of some of the mediators of inflammation, such as leukotriene-B4 and interleukin-1.(**De Vita et al., 1992**).

Fibromyalgia (FM or FMS) is a medical disorder characterized by chronic widespread pain and allodynia, a heightened and painful response to pressure (**Wolfe et al.,1990**).

Many people suffer from fibromyalgia (FM) without an effective treatment. They do not have a good quality of life and cannot maintain normal daily activity. Among the different hypotheses for its ethiopathophysiology, oxidative stress is one of the possibilities. Vegetarian diets could have some beneficial effects probably due to the increase in antioxidant intake. There is a high prevalence of obesity and overweight in patients, and weight control seems to be an effective tool to improve the symptoms.(**Arranz et al.,2010**).

Gout is a medical condition usually characterized by recurrent attacks of acute inflammatory arthritis—a red, tender, hot, swollen joint.(**Eggebeen ., 2007**).

Sustained hyperuricaemia is a risk factor for acute gouty arthritis, chronic tophaceous gout, renal stones and possibly cardiovascular events and mortality. Before starting lifelong urate-lowering drug therapy, it is important to identify and treat underlying disorders that may be contributing to hyperuricaemia. It is relevant to recognize the strong association of the insulin resistance syndrome (IRS) (abdominal obesity, dyslipidaemia, hypertension, raised serum insulin levels and glucose intolerance) with hyperuricaemia. In the obese, controlled weight management has the potential to lower serum urate in a quantitatively similar way to relatively unpalatable "low purine" diets. Non-fat milk and low-fat yogurt have a variety of health benefits and dairy products may have clinically meaningful antihyperuricaemic effects. In addition, fruits, such as cherries and high intakes of vegetable

protein diet may reduce serum urate levels. **(Schlesinger ., 2005).**

It is prudent to advise patients to consume meat, seafood and alcoholic beverages in moderation, with special attention to food portion size and content of non-complex carbohydrates which are essential for weight loss and improved insulin sensitivity. **(Lee., 2006).**

Osteoporosis is a disease affecting many millions of people around the world. It is characterized by low bone mass and micro-architectural deterioration of bone tissue, leading to bone fragility and a consequent increase in risk of fracture. **(Prentice., 1997).**

Calcium is one of the main bone-forming minerals and an appropriate supply to bone is essential at all stages of life. There has been considerable debate about whether current recommended intakes are adequate to maximize peak bone mass and to minimize bone loss and fracture risk in later life, and the controversies continue.

Vitamin D is obtained either from the diet or by synthesis in the skin under the action of sunlight. Many other nutrients and dietary factors may be important for long-term bone health and the prevention of osteoporosis. Among the essential nutrients zinc, copper, manganese, boron, vitamin A, vitamin C, vitamin K, the B vitamins, potassium and sodium . **(Department of Health. Nutrition and bone health., 1998).**

Osteoarthritis (OA) also known as degenerative arthritis or degenerative joint disease or osteoarthrosis, is a group of mechanical abnormalities involving degradation of joints, including articular cartilage and subchondral bone. **(MedlinePlus Encyclopedia).**

The strongest risk factor for OA, particularly of the knee, is overweight and obesity. Initial weight loss studies for the

treatment of OA have shown promising results, The ratio of dietary omega-6 to omega-3 fatty acids has been proposed to be related to OA because they are precursors of proinflammatory and anti-inflammatory eicosanoids and cytokines, respectively. However, human data are lacking to substantiate this relationship. Low serum levels of some vitamins, such as C and D, have been associated with OA in epidemiological research, but much more work must be conducted to understand the roles of these and other vitamins in OA prevention and treatment. **(Kathleen., 2007)**

Systemic lupus erythematosus SLE is a systemic autoimmune disease (or autoimmune connective tissue disease) that can affect any part of the body. It is a Type III hypersensitivity reaction caused by antibody-immune complex formation. **(James et al., 2005)**.

Dietary nutrients may modify clinical course of disease in female patients with SLE. Vitamin C intake is inversely associated with the risk of active disease, suggesting that vitamin C intake may prevent the occurrence of active SLE disease **(Minami et al., 2003)**. Higher intake of vitamin B6, B12, folate and dietary fiber may prevent the occurrence of active disease in SLE **(Minami et al., 2011)**.

The goals of dietary therapy in rheumatic diseases are alleviation of under- and malnutrition, inhibition of inflammation, prophylaxis of osteoporosis, as well as recognition and treatment of nutrient sensitivities or intolerances. Inflammation inhibition in these patients is improved by manipulating the omega-3/omega-6 fatty acids ratio in the diet. Reduction of dietary arachidonic acid is recommended. This polyunsaturated fatty acid is the main precursor of pro-inflammatory mediators which interact with chemokines and cytokines . **(Adam. ,2009)**.

List of contents

List of abbreviations

List of figures

Aim of the work

Rheumatoid Arthritis

Introduction.....1

Pathophysiology.....2

Nutrition and rheumatoid arthritis

Polyunsaturated and monounsaturated fattyacids..... 3

Nutritional status9

Nutritional intervention

-Mediterranean diet.....11

-Vegetarian diet13

-Elimination diet.....15

-Elemental diet19

Nutritional supplementation

- Fatty acids.....20

- Antioxidants28

- Folate and B vitamins.....32

-Zinc and Iron33

-Ca and vitamin D35

Osteoarthritis

Introduction.....	38
Pathophysiology.....	39
Nutrition and osteoarthritis	
Nutritional status.....	41
-Body weight, joint load and limb malalignment...	42
Nutritional intervention	44
Nutritional supplementation	
-Antioxidants.....	46
- Avocado and Soybean Unsaponifiables	54
-Fish oil.....	55
-S-adenosylmethionine.....	56
- Methylsulfonylmethane.....	57

Systemic lupus

Introduction.....	60
Pathophysiology.....	59
Nutrition and systemic lupus	
Nutritional status	60
Nutritional intervention and Supplementation.....	63
-Caloric restriction	64
-Low protein diets	66
-Lipids.....	67
-Vitamin D	69

-Vitamin A	73
-Vitamin C.....	74
-Vitamin E.....	76
-Fibers.....	77
-B complex	79
-Minerals	
Zn.....	80
Selenium.....	81
Calcium.....	81
Sodium.....	82
Copper.....	83
Iron.....	83
- Dihydroepiandrosterone	84

Gout

Introduction.....	88
Pathophysiology.....	89
Nutrition and Gout	
Nutritional status	
-Metabolic syndrome and hyperuracemia	91
-obesity.....	94
Nutritional intervention	
-Purine rich foods	96
-Vegetables, fruits and dairy	101

-Fructose.....	103
-Coffe and tea	104
-Alcohol.....	106
Nutritional supplementation.....	107
Osteoporosis	
Introduction.....	110
Pathophysiology.....	111
Nutrition and Osteoporosis	
-Biological roles of minerals and vitamins	112
-Dietary protein, fat and bone metabolism	121
Fibromyalgia	
Introduction.....	128
Pathophysiology.....	129
Nutrition and Fibromyalgia	
Nutritional status.....	136
Nutritional intervention.....	142
-Vegetarian diet	143
-Elimination diet.....	148
-Weight loss.....	152
Nutritional supplementation.....	153
Summary.....	157
Recommendations.....	161
References.....	164
Arabic summary	

Abbreviation list

AA	Arachidonic acid
ANAS	antinuclear antibodies
ALA	Alpha-linolenic acid
ACR	American College of Rheumatology
ACTH	Adrenocorticotrophic hormone
Anti LPL	anti-lipoprotein lipase antibodies
ASU	Avocado and Soybean Unsaponifiables
BOKS	Boston Osteoarthritis Of the Knee study
BCCA	Branched chain amino acids
BDI	Beck Depression Inventory
BSQ	Body Shape Questionnaire
BMI	Body Mass Index
BMD	Bone Mineral density
BILAG	British Isles Lupus Assessment Group
CMC	Carpometacarpal
CI	Confidence interval

CSF	Cerebrospinal fluid
CRP	C-reactive protein
DHA	Docosahexaenoic acid
DHEA	Dehydroepiandrosterone
DGLA	dihomo- γ -linolenic acid
DAS28	Disease Activity Score 28
DRIA	Dynamometric Challenge test
DIP	Distal interphalangeal
DMODS	Disease-modifying osteoarthritis drugs
DS	dietary supplements
dsDNA	double-stranded DNA
EPA	Eicosapentaenoic acid
ETA	Eicosatrienoic acid
ESR	Erythrocyte sedimentation rate
ESCEO	European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis
FFQ	Food Frequency Questionnaire
FMS	Fibromyalgia syndrome
FIQ	FM Impact Questionnaire

GLA	γ -linolenic acid
GAG	Glycosaminoglycan
GAIT	Glucosamine/chondroitin Arthritis Intervention Trial
GH	Growth hormone
GPX	Glutathione peroxidase
HAQ	Health Assessment Questionnaire
HPFS	Health Professionals Study
HDL-C	High-density lipoprotein cholesterol
5HT	5-hydroxytryptamine
HPA	Hypothalamic-pituitary-adrenal
IOF	International Osteoporosis Foundation
IOM	Institute of Medicine
IGF I	insulin-like growth factor I
IDA	Iron deficiency anaemia
IL-2	Interleukin-2
IFN- γ	Interferon- γ
IL-1 β	Interleukin-1 β
JSN	Joint-space narrowing

LTB4	4-series leukotrienes
LPS	lipopolysaccharide
LED	Low energy Diet
LDL	Low-density lipoproteins
LA	linoleic acid
MUFAS	Mono-un saturated fatty acids
MTX	Methotrexate
MMP	Matrix metalloproteinases
MSM	Methylsulfonylmethane
MSG	Monosodium glutamate
MPI-I	Multidisciplinary Pain Inventory – interference
MS	Metabolic syndrome
NO	nitric oxide
NOF	National Osteoporosis Foundation
NHNANES III	Third National Health and Nutrition Examination Survey
NZB/NZW (BW) F1	New Zealand Black/White
OA	Osteoarthritis
ONNO-	peroxinitrite

OPG	Osteoprotegerin
O ₂ -	Superoxide radical
OE	Oxidative stress
PDGF	platelet-derived growth factor
PUFAS	Polyunsaturated fatty acids
PGE ₂	Prostaglandins E ₂
PIP	proximal interphalangeal
PTH	parathormone
QOL	Quality of Life
RA	Rheumatoid Arthritis
RF	Rheumatoid factor
RDA	Recommended Daily Allowances
RNI	Recommended Nutrient intakes
RCT	Randomized controlled study
ROS	Reactive oxygen species
RANK/L	Receptor Activator for Nuclear Factor κ /Ligand
RR	Relative Risk
RMR	Resting Metabolic Rate
SAH	Subarachnoid hemorrhage