

## FETAL NOURISHMENT AND FETAL GROWTH

MODULE	CONTENT	YEAR	TERM	CREDITS	TYPE
Training accessories	Feeding at different stages of life	4rd	1st	6	Optional
<b>LECTURER(S)</b>			<b>Postal address, telephone nº, e-mail address</b>		
<ul style="list-style-type: none"> <li>Olga Ocón Hernández</li> </ul>			Obstetrics and Gynecology Department. School of Medicine. Avda. De la Investigación, 11 18016 Granada (Spain). Tower A, 10th floor. Phone +34 958 24 28 67 – 958 24 28 73 Fax +34 958 24 28 67 e-mail address: oocoh@ugr.es		
<b>DEGREE WITHIN WHICH THE SUBJECT IS TAUGHT</b>					
Human nutrition and dietetics					
<b>PREREQUISITES and/or RECOMMENDATIONS (if necessary)</b>					
<ul style="list-style-type: none"> <li>Not necessary</li> </ul>					
<b>BRIEF ACCOUNT OF THE SUBJECT PROGRAMME (ACCORDING TO THE DEGREE)</b>					
Nutrients functions, metabolic utilization, needs and requirements in pregnancy and lactation. Design of diets in normal and pathological pregnancy and lactation. Basic physiology of the reproductive process. Implications of nutrition of pregnant fetal development and perinatal outcomes.					
<b>GENERAL AND PARTICULAR ABILITIES</b>					
A. Basic abilities  CB1- The students have to demonstrate knowledge and understanding in a field of study that comes from the basis of general secondary education, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects involving knowledge of the forefront of their field of study CB2 - That students can apply their knowledge to their work or vocation in a professional manner and have competences typically					



demonstrated through devising and sustaining arguments and solving problems within their field of study

CB3 - That students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include reflection on relevant social, scientific or ethical

CB4 - That students can communicate information, ideas, problems and solutions to an audience both skilled and unskilled

CB5 - That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

#### B. General abilities

CG2 - To develop their career with respect for other health professionals, abilities for teamworks

CG3 - To recognize the necessity of actualizing their professional competence, paying special attention to learn in an autonomous and continuous way new approaches, products and techniques in nutrition and feeding

CG1 - To recognize the essential elements of the profession of the Dietitian - nutritionist, including the ethical principles, legal responsibilities and the exercise of the profession, applying the beginning principle of social justice to the professional practice and developing it as for the persons, their habits, beliefs and cultures

CG4 - To know the limits of the profession and competences, identifying when necessary interdisciplinary treatment or referral to another professional

CG5 - Making effective communication, both orally and in writing with people, health professionals or industry and the media, knowing how to use information technologies and communications, particularly those related to nutrition and lifestyle

CG6 - Understand, critically evaluate and how to use and apply sources of information related to nutrition, food, lifestyle and health aspects

CG12 - Know the nutrients, their function in the body, their bioavailability, needs and recommendations, and the basis of the energy balance and nutrition

CG14 - Apply scientific knowledge of physiology, pathophysiology, nutrition and food to planning and dietary advice to individuals and communities, throughout the life cycle, both healthy and sick

CG15 - Design and implement protocols for assessment of nutritional status, identifying nutritional risk factors

CG16 - Interpret a nutritional diagnosis, evaluate the nutritional aspects of a medical history and dietary action plan

CG29 - Acquire basic training for the research activity, being able to formulate hypotheses, collect and interpret information to solve problems using the scientific method, and understand the importance and limitations of scientific thinking on health and nutrition

#### C. Cross abilities

CT.2 - Ability to use ICT (*Information and Communications Technology*) jauntily

#### D. Specific abilities

CE27 - Evaluate and calculate nutritional requirements in health status and disease at any stage of the life cycle

CE31 - Plan, perform and interpret the evaluation of the nutritional status of individuals and / or groups, both healthy (in all physiological situations) and ill

#### OBJECTIVES (EXPRESSED IN TERMS OF EXPECTED RESULTS OF THE TEACHING PROGRAMME)



Knowledge of the physiological basis of reproductive process (pregnancy and lactation) and the mechanisms of maternal-fetal exchange.  
Knowledge of the importance and impact of good nutrition during pregnancy on fetal development and perinatal outcomes.  
Ability to nutritional counseling and care (normal and pathological) pregnancy and lactation.

## DETAILED SUBJECT SYLLABUS

Theory:

- 1 - . **Introduction.** Concept and content of the subject. The gestation. The Maternal -Fetal Unit: mother, placenta and fetus as a functional unit, respective roles. Basic outline of the development of the subject.
- 2 - . **Development and embryo nutrition in the early stages of pregnancy.** Implantation. Placentation. Adaptive changes in placental vascular structure. Exchange processes between maternal and embryo during the first quarter of pregnancy.
- 3 - . **Placenta as an organ of exchange.** Structure of the placenta, circulation in the intervillous space and mechanisms of placental transfer. Endocrine function of the placenta.
- 4 - . **Mother.** Physiological changes during pregnancy: genital tract, breast, hematologic changes, cardiovascular system, respiratory system, digestive system, renal system, endocrine changes, and other changes.
- 5 - . **Fetus.** Fetal development. Growth curves. Fetal composition throughout gestation. Variation in fetal needs according to gestational age. Metabolism of fetal organs.
- 6 - . **Nutritional needs during pregnancy and lactation.** Recommendations for nutritional support during pregnancy and lactation. Interpretation of the methods of assessment of nutritional status during pregnancy. Rating nutrient requirements and adequate dietary intake. Factors influencing nutrient requirements and the need for supplementation. Nutrient - nutrient interaction. Nutrient toxicity.
- 7 - . **Maternal weight gain during pregnancy.** Fundamental components. Link to other variables. Criteria for interpretation. Collecting information in the query. Ideal weight gain. Effect of weight gain during pregnancy on perinatal outcome: singleton pregnancy and twin pregnancy.
- 8 - . **Energy cost of the reproductive process** (pregnancy, childbirth and lactation). Components of energy consumption. Calculation of energy requirements. Energy supplementation in the diet.
- 9 - . **Maternal nutrition and fetal growth.** General concepts. Studies in animal testing. Experiences in humans: situations of malnutrition, studies on dietary supplementation during pregnancy. Maternal nutrition and birth weight.
- 10 - . **Fetal growth disorders.** Excessive fetal growth and intrauterine growth restriction: etiology, diagnosis , risk, behavior. Long-term consequences of in utero nutritional disturbances.
- 11 - . **Metabolism of essential elements during pregnancy.** Carbohydrates. Lipids. Amino acids and proteins.
- 12 - . **Fetal metabolism.** Fetal oxygen consumption. Fetal energy substrates. Carbohydrates. Lipids. Amino acids and proteins.
- 13 - . **Dietary advices during pregnancy.** General recommendations. Distribution of food during the day. Food flavoring. Supplementation of the diet prior to pregnancy: food selection. Vegetarianism and pregnancy.
- 14 - . **Maternal nutrition and breastfeeding.** Energy needs of the newborn. Specific properties of human milk. Requirements and composition of human milk. Establishment and maintenance of breastfeeding. Advantages of breastfeeding. Clinical use and storage of human milk. Nutrition in nursing women. General recommendations. Breastfeeding in special situations: vegetarian diets.



15 - **Vitamins during pregnancy and lactation.** Fat-soluble vitamins: A, D, E, K. Water-soluble vitamins: B6, B12, folate, C, other water-soluble vitamins.

16 - **Minerals and trace elements during pregnancy and lactation.** Minerals: calcium, phosphorus, magnesium. Trace elements: iron, zinc, copper, manganese, iodine, and others.

17 - **Nutrition in thin pregnant.** General concepts. Concept of thinness and weight loss. Types of thinness. Nutritional requirements of pregnant slim. Perinatal outcomes. Nutritional counseling.

18 - **Nutrition in pregnant women with anorexia nervosa (A) and bulimia (B).** Definition. Etiology. A and B during pregnancy. Nutritional issues. Risks and maternal and fetal outcomes. Nutritional intervention in pregnant women with A and B. Monitoring and evaluation.

19 - **Nutrition in pregnant women with overweight and obesity.** General concepts. Risk of overweight and obesity. Genetic and constitutional factors, psychological factors. Obesity and perinatal outcome. Prenatal care and nutritional counseling for obese mother.

20 - **Nutrition in pregnancy and lactation in adolescent women.** General concepts. Nutrient requirements during adolescence. Teenage pregnancy. Morbidity. General and specific recommendations.

21 - **Dietary management of pregnant women with digestive diseases.** General concepts. Hyperemesis gravidarum. Hiatus hernia and gastroesophageal reflux. Gastritis. Gastroduodenal ulcer. Gastric surgery. Malabsorption syndromes. Diarrhea. Constipation. Liver disease. Diseases of the gallbladder. Pancreatitis.

22 - **Pregnancy and diabetes.** General treatment goals. Characteristics of the diet. Nutrition in gestational diabetes. Caloric content. Immediate principles. Distribution of meals in the day.

23 - **Pregnancy and phenylketonuria.** General concepts. Effects of maternal phenylketonuria on the fetus. Reproductive counseling. Conduct during pregnancy. Results of treatment.

24 - **Nutrition in twin pregnancy.** General. Weight gain. Energy cost of the reproductive process. Ideal diet in twin pregnancies.

25 - **Parenteral nutrition during pregnancy.** General. Directions. Access roads. Preparations used. Technical and controls. Objectives of nutritional support during pregnancy. Calculation needs. Complications.

26 - **Consumption of alcohol during pregnancy and lactation.** General. Maternal-fetal alcohol metabolism. Effects of alcohol on pregnancy: fetal abnormality. Effects on newborn behavior. Other complications. Preconception advice. Conduct during pregnancy and during lactation.

27 - **Caffeine consumption during pregnancy and lactation.** General. Maternal-fetal caffeine metabolism. Effects of caffeine on pregnancy: spontaneous abortion. Congenital malformations. Fetal growth. Other effects. Effects of caffeine on maternal nutrition. Effects of caffeine on breastfeeding.

PRACTICAL AGENDA (Seminars / Workshops)

SKILLS WORKSHOPS. -

1 - Simulation of a query in which students must quantify nutrient requirements of different pregnant or lactating patients, establish patterns of ideal weight gain in a pregnant, and calculate the energy requirements appropriate for pregnant patients or during lactation.

2 - Preparation of diets for normal pregnancies depending on their specific needs, including pregnant vegetarian diets. Recommendation of appropriate pharmacological or dietary supplementation of vitamins, minerals and trace elements according to the different types of patients.



3 - Calculation of requirements and preparation of diets for pregnant thin or overweight/obesity. Nutritional counseling in pregnant teenagers or multiple pregnancies. Nutritional management of pregnant women with diabetes mellitus.

4 - . Reproductive/preconception advice in patients with obesity, diabetes, phenylketonuria or consuming alcohol.

#### SEMINARS - .

1 - . Methods of assessing the nutritional status and its application to gestational state.

2 - Critical review of the scientific evidence related to nutritional aspects during gestation.

3 - Scientific bibliographic search.

4 - Food toxic infections and pregnancy. Food hygiene.

5 - Exercise and pregnancy. Evidence and nutritional aspects.

#### GROUP WORK -

Realization, presentation and discussion of a paper suggested by the teacher about any aspect of the course topic.

#### REFERENCES

Scott JR et al (eds): Tratado de Obstetricia y Ginecología de Danforth, 6ª ed, Editorial Interamericana-Mc Graw-Hill, México DF 1990. ISBN: 968-25-2206-4

Lammi-Keefe CJ, Couch SC, Philipson EH (eds): Handbook of Nutrition and Pregnancy. Editorial Humana Press, Totowa (USA) 2008. ISBN: 978-1-58829-834-8.

González de Agüero R, Sobreviela M, Fabre E: Alimentación y Nutrición de la mujer en el embarazo. Editorial Edelvives, Zaragoza 1992. ISBN: 84-604-0980-5.

González de Agüero Laborda R y Fabre González E (eds): Nutrición y Dietética durante el embarazo. Editorial Masson, Barcelona 1996. ISBN: 84-458-0372-7.

Morgan JB, Dickerson JWT (eds): Nutrition in Early Life. Editorial John Wiley&Sons Ltd., Chichester (UK) 2003. ISBN: 0741-49624-3.

Mahan LK y Escott-Stump S (eds): Nutrición y Dietoterapia de Krause, 10ª ed, Editorial Mc Graw-Hill- Interamericana, México DF, 2001.

Mataix Verdú J (ed): Nutrición y Alimentación Humana. Editorial Ergon, S.A., Majadahonda (Madrid), 2002. ISBN: 978-84-8473-088-0

Cunningham FG et al (eds): Williams Obstetricia, 21ª ed, Editorial Médica Panamericana, Madrid 2003. ISBN: 950-06-0429-9.

Cabero Roura, L et al (eds): Tratado de Ginecología, Obstetricia y Medicina de la Reproducción. Editorial Médica Panamericana, Madrid 2003. ISBN: 84-7903-756-3.



Hamaoui E y Hamaoui BA: Nutritional assessment and support during pregnancy. *Gastroenterol Clin N Am* 2003; 32:59-121

Gil Hernández A, et al (eds): *Tratado de Nutrición*. Editorial Acción Médica, Madrid, 2005. ISBN: 84-88336-40-3.

**FURTHER READING :**

Most relevant literature will be provided thorough teaching platform to support theory and practice in each individual item, in PDF or PowerPoint format

**RECOMMENDED INTERNET LINKS**

<http://www.nap.edu>

In this address could be found the recommendations of all nutrients during all stages of life of the *Institute of Medicine* of the USA.

<http://www.choosemyplate.gov/>

It this link, you can do, in a practical way to, calculations on nutritional needs of pregnant and breastfeeding depending on their characteristics (size, weight, gestational age ...) with the possibility of designing diets for each day of the week.

<http://dietamediterranea.com>

Website of the Mediterranean Diet Foundation. It provides information on this type of diet and daily menus examples with seasonal foods.

