

# Gender discrimination for women with diabetes mellitus in Algeria

Farida Chentli, Said Azzoug, Djamila Meskine, Aldjia El Gradechi

Department of Endocrine and Metabolic Diseases, Hôpital Bab El Oued, 5 Boulevard Said Touati Algiers, Algeria

## ABSTRACT

**Background:** Nowadays diabetes mellitus (DM) is one of the greatest global challenges. Its expansion varies from an area to another according to genetic, traditions, socio-economic conditions, and stress. In Algeria, as in other emerging countries undergoing an epidemiological transition, noncommunicable diseases are sharply increasing. After high blood pressure, DM is now the second metabolic disease. But are women more concerned by DM since obesity frequency is higher in females? Can we assert that there is a sort of sex discrimination for DM complications? **Materials and Methods:** To answer these questions we took into account published documents carried in Algerian population. But, as those were very scarce, we also considered newspapers articles, some documents published by health minister department, posters and oral communications of the Algerian Society of Endocrinology and Diabetology, and our clinical experience. We also have done a small survey to get our patients' opinions. **Results and Conclusion:** At the first sight, it seems gender discrimination between men and women cannot exist since most epidemiological studies showed that both sexes are broadly and equally affected by DM, except for old aged females who are the most affected. When we reconsidered the problem, and when we compared past results to those obtained after the terrorism period, many studies showed a sort of gender difference. Apart from gestational DM, which is increasing sharply, some complications and death related to DM are prevailing in women. Coronary diseases and cerebral vascular accidents are more frequent in women too, especially the young ones and those suffering from DM. These complications are probably due to the recent and rapid modification in women's lifestyle with a strong reduction in physical activity, eating disorders, hormonal contraception, and high sensitivity to perceived stress secondary to the near past stressing life and/or to numerous responsibilities taken by women in the modern society.

**Key words:** Algeria, diabetes mellitus, gender discrimination

## INTRODUCTION

Nowadays, diabetes mellitus (DM) is one of the eight most prevalent health conditions in the global world<sup>[1]</sup> as 371 million people are affected.<sup>[2]</sup> Among this group 80% live in low- and middle-income countries and almost 50% are undiagnosed.<sup>[2]</sup>

With its numerous complications, DM is considered as one of the major chronic and disabling diseases. On the

socio-economical point, it is becoming the hugest and the most expensive growing global burden<sup>[3]</sup> as more than 471 billion USD are regularly spent on healthcare for DM.<sup>[2]</sup> Its increasing frequency varies from an area to another according to genetic, traditions, hormonal status, socio-economic conditions, urbanization, physical activity, and stress.

Some countries are more affected than others. In Algeria, DM is the 2<sup>nd</sup> most prevalent chronic disease after high blood pressure (HBP). According to an epidemiological study, DM accounts for 12.33% among people aged between 35 and 70, comparatively to 24.5% for HBP and 9% for respiratory diseases.<sup>[4]</sup> For the same study, 4.8% of hospitalizations due to non-transmissible diseases are related to DM. On the other hand, 7.4% of total deaths are also due to DM and women deaths account for 4%.

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**Corresponding Author:** Prof. Farida Chentli, Department of Endocrine and Metabolic Diseases, 5 Boulevard Said Touati Algiers, Algeria.  
E-mail: [Chentli.f@gmail.com](mailto:Chentli.f@gmail.com)

In Algeria, most people with DM are also diagnosed at an early age:  $45.12 \pm 10.13$  years.<sup>[5]</sup> The increasing frequency of this noncommunicable disease can be explained by numerous factors, especially the combination of genetic predisposition<sup>[6,7]</sup> and recent modifications of our environment.<sup>[8]</sup> A study carried out in West Algeria between 2008 and 2009, including 551 persons (280 type 2 DM and 271 control subjects) showed that low educational and economic levels, a high number of children and problem of overcrowding in homes, obesity, modification in lifestyle-habits with physical inactivity and irregular food intake, older age, and hypertension are the most important environmental risk factors for DM in Algeria.<sup>[8]</sup> Concerning genetic, it is clearly demonstrated that in our areas interfamily marriages and family history of DM are statistically and significantly higher in people with DM type 2<sup>[7,8]</sup> and type 1<sup>[6]</sup> than in those without DM.

Except in old people ( $\geq 65$  years) in whom DS is clearly prevailing in women (29% vs. 22% for men),<sup>[9]</sup> epidemiological studies showed contradictory results about greater prevalence of DM in women. Although, the difference in frequencies is not very significant, it is clearly demonstrated that women are at higher risk for DM complications; especially for cardiovascular ones as women's arteries are thinner than men's and their glucose control is generally poor which could lead to compact clots compromising fibrinolysis.<sup>[10]</sup> On the other hand, sedentary life is considered as another cause, too, as most Algerian women are housewives or jobless. In 2011, statistical analyses showed that only 17% have a job versus 5% in 2005.<sup>[11]</sup> Hence, the lack of physical activity and eating disorders probably predispose them to obesity then DM and metabolic syndrome, and let them be more prone to cardiovascular complications. Apart from anatomic differences, obesity and sedentary lifestyle, hormonal diseases (much more frequent in women), contraception, numerous pregnancies, deficit in Vitamin D, and increasing in life expectancy are probably the most important causes for the gender difference.

In this article, we will first deal with available results concerning DM frequency, and then we will try to find out things that may be different in diabetic women comparatively to men suffering from the same disease.

## DIABETES MELLITUS FREQUENCY IN ALGERIA

Diabetes mellitus is an important and common health problem in our society as its frequency increased from 8% in 2001<sup>[12]</sup> to 12.29 in 2005,<sup>[4]</sup> 14% in 2007,<sup>[13]</sup> and 16% in 2013 (Lezzar EK: Unpublished results).

As in other countries DM seems to be more frequent in urban areas than in rural ones as Tahina's study<sup>[4]</sup> noted 13% for urban zones vs. 9% for rural ones and Zaoui *et al.*<sup>[13]</sup> found 15.3% persons with DM among people living in urban areas compared to 12.9% among those living in rural regions. This can be understood by the fact that in Algeria, as in other African countries,<sup>[14]</sup> urban lifestyle is now characterized by a sedentary life and a total modification in dietary habits leading to an increase in consumption of refined sugars, saturated fat, and a strong reduction in fibers<sup>[4]</sup> used to be the base of our alimentation.

## IS THERE ANY GENDER DIFFERENCE OR GENDER DISCRIMINATION BETWEEN MEN AND WOMEN IN ALGERIA?

At first sight one is tempted to say no, but when we think seriously and focus more on the subject we can find some differences such as a kind of discrimination or a gender difference between women and men, knowing that we live in a developing country where education for girls is not a priority and where obesity is considered as a sign of good health and wealth. Other differences, not specific to our country, are probably due to hormonal problems.

First of all, except for one or two works that showed a higher prevalence in women,<sup>[13]</sup> DM percentage is broadly similar in both sexes<sup>[4,8,12]</sup> for statistical studies. However, if we consider environmental problems, one can guess that women are relatively at higher risk for DM and its complications for many reasons.

The first one is probably the hormonal profile since estrogens and progesterone are considered as hormones leading to obesity. Tahina study<sup>[4]</sup> demonstrated that the obesity accounts for 21.2% in the whole Algerian population, but it is prevailing in females (31.1% vs. 21.1% for men). This could explain at least why according to the same study DM is slightly prevailing in females (12.95% vs. 11.9%).

For Latifa and Kaouel<sup>[15]</sup> obesity is also more frequent in females: 27.9% versus 10.5%. A recent study concerning obesity has also confirmed the difference between women (30%) and men (7%).<sup>[16]</sup> Another study, that took into account people consulting for DM showed that overweight and obesity are more frequent in women (39%) compared to the male population (27%).<sup>[17]</sup> Combined oral contraceptive pills and numerous pregnancies can also lead to the same problems.<sup>[18]</sup> A survey study carried in 2002 showed that the contraceptive method the most used by Algerian women remains the pill.<sup>[19]</sup>

The second problem is the total change in our lifestyle. Indeed, in the far past and before our independence, despite a very rich soil most people were poor and thin. The majority lived and worked in the countryside where cars, motor bikes, buses and trains were lacking, and where industrialization and westernization were totally absent. Our economy was mainly based on agriculture and crafts. People were relying on themselves, moving on foot and working very hard to get their food. But, what were men and women respective roles in that society?

Men used to work hard outside in the fields to provide food for the whole family. Young and middle age women stayed at home to bring up children, run their house and cook. Fridges, cookers, mixers and vacuum cleaners did not exist. Food was poor in sugar and fat, but very rich in fibers and fruit.

Women did not stop doing physical activities as everything was handmade. Even old women and grandmothers helped in the fields, side by side with men. They had to walk kilometers and kilometers to bring water, and wood. Widows and poor women were forced to work very hard in the fields and even at home making potteries and carpets in order to support their families' expenses.

Life was hard for men and harder for women. But, from time to time women could relax, visit friends and families, and organize small parties where everyone had moments of joy to forget life problems.

Women used to get married very young and at the age of 20 years old they already had many children. Due to religious, socio-cultural and economic considerations, contraception was not used by women. Some of them did not even know their real age and never felt bored or losing their time. They were not stressed. Unlike modern life, everything was quiet and peaceful, except, when the mother-in-law was harsh. Women were not used to count days, months and years, probably because they were not stressed at all. For girls life was calm, except for rebel ones who from time to time were revolted against the lack of education. The reason was that when an opportunity to go to school was offered, parents sent boys. Parents thought there was no need to send girls to school as they had to stay at home and run their houses properly. Going to school for a girl? What for?

Most women were aware of that difference. The majority considered being a woman was a consequence of bad luck or a spell. When they get married, the first thing to do was to be pregnant and have a boy first in order to preserve their place and to please their mother-in-law. Women had

minimum 8 to 10 pregnancies. Women having only girls were either abandoned or repudiated.

As women were very active and did not have a lot of things to eat, most of them were very thin or even skinny. Obesity and insulin resistance did not exist, of course. The best food was served for men. White bread and meat were reserved for men, too.

Mothers educated girls to be kind, gentle, and very obedient as they had to serve all the members of the family and especially males all their life.

Women, themselves, were convinced to be born to do everything to satisfy the needs of their fathers, their brothers, husbands and even their male cousins. Old women were convinced that young ones should be healthy, nice, and physically and psychologically strong. If you were overweighted or obese, blond with green or blue eyes you would go very far. If you were plain, disabled or ill you would be rejected. There would be no marriage, no children and no social and sexual life! It was not the same for men: Disabled, ill or old, they had their place in the society. Being diabetic could be disturbing for a man since this require diet, regular visits to doctor and spending money for medicine. Whereas, being diabetic for a woman was and is still considered as a spell, especially for a young person. When a young woman is diagnosed with DM, the disease is considered a misfortune that falls down on the family home: A tragedy for the whole family. Parents are shocked and ashamed about this condition. They hide the truth to other members of their own family, other parents and neighbors. Due to illiteracy or fear of pharmaceutical products, people prefer using herbs or traditional products than insulin and oral anti diabetic drugs, and until now, it is clearly demonstrated that 28% of Algerian population still prefer using traditional medicine.<sup>[20]</sup>

The preference for the traditional treatment leads to frequent and severe complications, especially Ketoacidosis when the substance is inefficient and to severe hypoglycemia when the substance is efficient or toxic.<sup>[20]</sup> This is why most reasons for hospitalizations before the eighteen's were ketoacidosis and severe hypoglycemias. Nephropathies, retinopathies, and all kind of infections were frequent complications, too. Urinary and skin infections were very frequent in women, and tuberculosis was the most terrible disease in both sexes, but especially in women with DM as they were undernourished. However, feet lesions were less frequent in women,<sup>[21-24]</sup> probably because of better hygiene, less smoking, and less peripheral arterial and neurological lesions than in men. Due to low socio-economic conditions, dyslipidemia and cardiovascular complications were rare in

women. Only men were concerned in a relatively low rate, probably because they eat and smoke more.

After 1962, Independence date, the government obliged parents to send their daughters to school. Girls who went to school were motivated, succeeded in their studies, had important jobs, and began to eat properly. As they were very productive, some parents changed their minds about the difference between boys and girls. Women became more and more ambitious and autonomous, but also much stressed. Men became lazier or wanted to be rich in a short time, they preferred being business men than teachers, engineers or doctors. Some relied totally on their sisters even to pay their cigarettes or to get married.

Between 1990 and 2000, it was a period of terrorism. Everything bad was related to women considered as evils. If men could not find jobs, women were considered as being responsible for that. Men were persuaded that women took their places.

A lot of women had to stop working and leave the areas where they were living as everything was forbidden to them. Fear and stress were at their maximum, and their impact on woman's health did not take a long time to appear: Sudden death, extreme fatigue, depression, HBP, DM and cardiovascular diseases. Coronary heart diseases began to appear not only in very young men, but especially in women. A multicenter study carried after the period of terrorism (2003-2005) showed that coronary insufficiency became frequent in women and in men as well, especially in the young population.<sup>[25]</sup> Acute and severe accidents are now being observed in women aged 30 or even less. On the other hand, cerebral vascular accidents (CVA) are as frequent in women as in men, but women who had CVA are younger (57 vs. 63 years),<sup>[26]</sup> and in some departments of cardiology death secondary to coronary arterial disease is more frequent in women with DM than in men.<sup>[27]</sup> The main reason seems to be a strong stress and major modification of the environment and life style. Now, Algeria is considered as an emerging country. Its economy is based on oil and gas. People are richer but less motivated and even lazier. Agriculture is less popular, and handcrafts are nearly totally abandoned. Some people rely totally on the government subsidization. Flour, semolina, sugar, milk are relatively low cost. People buy a lot of bread: 6-10 baguettes/per day/per family and sometimes more. Kilograms and kilograms of sugar are used for baking cakes and making sodas. Coke, red and yellow, but also green and orange lemonades are exhibited outside and sold everywhere in giant plastic bottles with a relatively low price. There is much sugar in each bottle, each loaf of bread and each cake than in similar products made and

sold in other countries. Algerian people do like sugar and sweets. Since the Independence they have been used to take much sugar, more than other populations, probably because they did not pay the real price. They became progressively addicted to sugary food. It seems there is a strong passionate relationship between Algerian people and sugar!<sup>[28]</sup>

Eating a lot of hamburgers and fries becomes a new fashion, too. Even housewives prefer eating pizzas and sandwiches than preparing couscous or another traditional dish, because cooking is time consuming and tiring. Most housewives prefer watching TV and dreaming about Egyptian, Turkish, or Mexican heroes than cooking or doing sport. The total lack of physical activity, increased intake of sugary and fatty food, the fact that obesity is prized in our society and the past stressing life due to terrorism are probably responsible for the increased rate in overweight and obesity.

In our society, women are more and more concerned by obesity, but they are not disturbed at all; as for the majority it is a sign of wealth! When consulting, Algerian women never complain about overweight or obesity as demonstrated in a study comparing French women to women from North Africa. If you ask about family obesity, they will answer negatively. But, if you ask the question different ex: Are there any persons who are as strong as you in your family, then they will tell you yes, of course, there are.

In Algerian Sahara where people used to be thin and where DM frequency was low,<sup>[29]</sup> women are now using high quantities of steroids, fenugreek or other products sold in the markets<sup>[30]</sup> to help themselves and especially their daughters to put on weight. Lack of physical activities and modification of life style are for something, too. As a result, DM is more frequent in some areas of our desert than in developed countries.<sup>[31]</sup> Salt is also used without moderation that causes a high rate of HBP, which is the most frequent chronic disease with DM.<sup>[32]</sup> Imported products such as different kind of cheese, sausages, and canned products are very prized and are substituting our natural and delicious Mediterranean food and mineral water. Our vegetables and fruit grown in sunny areas are, as a paradox, kept in cool rooms before being sold. People are very fond of bread probably also because vegetables and fruit are relatively expensive, and nowadays the "white artificial bread" made with flour, oil, rising powder, sugar, plus an improver (which is probably toxic) is replacing the brown natural one. Women who were used to make homemade bread are buying the "artificial" baguettes from supermarkets even in Ramadan, a period during which they used to bake bread. In Algeria, women do



like bread, they cannot have their tea or coffee or eat any food without bread; this could explain high frequency of abdominal obesity and high rates of triglycerides in women,<sup>[27,33]</sup> but also poor diabetes control prevailing in females. When you ask about the poor glycemic control women reply they don't comply diet because they do not have money to buy vegetables or prefer giving good things (especially vegetables and fruit) to their children and husbands. Is this altruism the only cause? We do not know exactly.

Hence, in Algeria as in South Asia,<sup>[34]</sup> low literacy, traditions of eating a lot of bread, sugary, salty and fatty food, the consideration for obesity added to consanguineous marriages and lack of sport multiply the risk for DM, hypertension, and metabolic syndrome in both sexes but, especially in women.<sup>[35]</sup> In our streets one can be shocked by people with metabolic syndrome, especially people in young age and children, but women are more affected. Different studies showed that obesity in adults and children is due to eating disorders,<sup>[35-38]</sup> especially in urban areas.<sup>[37]</sup> Due to their physiology and other mechanisms females are more concerned, normal weighed ones are miserable as people consider them meager and sick.

Some endocrine diseases inducing DM such as thyroid dysfunction, Vitamin D deficiency, Cushing's syndrome, are also probably for something in the gender difference as they are prevailing in women. Polycystic ovary syndrome is another cause of obesity and insulin resistance in women too.

Getting married late is probably another mechanism for incidence increase of metabolic diseases in women. According to Algerian health minister women are now getting married at over 30:<sup>[39]</sup> 31.9 years in 2002 vs. 18.3 in 1966<sup>[11]</sup> and have children later. As a consequence, they are at high risk for DM, hypertension, and other features of metabolic syndrome.

The late and numerous pregnancies could also explain the gender difference between men and women for DM or at least for obesity. During pregnancy, most women put on weight and do not consult for this, because of their ignorance and because people think they are more attractive, and it is more convenient for breastfeeding. As a consequence a French study comparing 73 women from Maghreb (the majority from Algeria) aged 21 to 29 years old and having 2-3 children, showed women from Maghreb are more affected by DM during pregnancy (24%) than the European ones (8%) and 6% give birth to obese children.<sup>[40]</sup> Furthermore, these mothers are not systematically explored for DM and parents are very proud of obese newborns. The

lack of diagnosis and control leads to diabetic retinopathy's worsening during pregnancies.

Vitamin D deficiency is probably a supplementary cause for DM mellitus in women. Actually, Vitamin D deficit is now considered to be another world health problem because of its high frequency and its consequences. Apart from DM, Vitamin D deficiency is involved in autoimmune, neoplasias, cardio-metabolic diseases, and DM.<sup>[41]</sup> Although Algeria is a very sunny country, recent modifications of our clothing due to terrorism and new fashion of a strong belief for Muslim religion exaggerated by the fear of being considered as a non-believer is probably responsible for Vitamin D deficiency which is more frequent in women. In Algeria, the frequency of profound Vitamin D deficiency is probably not very far from the one of Middle Eastern countries rates. Because, Vitamin D deficiency is very frequent in children and adolescents<sup>[42]</sup> and osteomalacia or adult's rickets became more and more frequent. So, as in south Asia,<sup>[34]</sup> social, religious, economic and cultural barriers prevent the adoption for healthy life style in Algerian society. The persons who are paying the bills are women. Most of them have many children; some are working at home and outside so they are much more stressed, especially many men are relying totally on their wives for children education and even for other things. Women life style has totally changed, especially on the economical side, but they are now deficient in Vitamin D and obese, with DM, hypertension, and metabolic syndrome. Women in Algeria wanted to be autonomous and free themselves, but they are in a prison with gender discrimination due to diseases characterizing both developed and emerging countries. Women are now concerned by cardiovascular diseases and diabetic ones are much more affected.<sup>[27,33,43]</sup> Temmar's study showed that contrary to old European women who have a lower arterial stiffness compared to men, women in Algeria exhibit an arterial stiffness similar to men, probably because of higher body mass index, blood pressure, high cardiac rate, worse metabolic profile and a lot of stress.<sup>[32]</sup>

Increase in life expectancy is another problem as women life expectancy which was 54 years in 1970 passed to 75 years in 2004.<sup>[11]</sup> As DM is positively correlated to old age, we should have more DM among women. A study carried in West Algeria showed that among 393 subjects aged 65 or more, 26.7% are diabetic, and women are more concerned (29.9% vs. 22%).<sup>[9]</sup>

## CONCLUSION

Although statistical analyzes do not clearly show a higher frequency of DM in women (except for old age), obesity,

hypertriglyceridemia and heart complications are more frequent and more severe in women with DM. Numerous and severe cardiovascular complications in women are probably due to their thinner arteries, but also to poor control of different features of metabolic syndrome such as obesity, hyper triglyceridemia and HBP. The prevention should begin very soon at school or even before by reinforcing education and explanations in both sexes, but especially for girls.

## REFERENCES

- Martínez-Pérez B, de la Torre-Díez I, López-Coronado M. Mobile health applications for the most prevalent conditions by the World Health Organization: Review and analysis. *J Med Internet Res* 2013;14:15:e120.
- International Diabetes Federation: IDF Diabetes Atlas. 5<sup>th</sup> ed. Brussels, Belgium. Update 2012. Available from: <http://www.idf.org>. [Last accessed on 2014 Jul 05].
- Kapur A, Harries AD. The double burden of diabetes and tuberculosis-Public health implications. *Diabetes Res Clin Pract* 2013;S0168-822700497-4.
- Tahina Study: National Institute of Public Health. Project TAHINA (Epidemiological transition and health impact in North Africa). National Health Survey 2005 (Contract N°IC A3-CT-2002-10011). Available from: <http://www.and.s.dz>. [Last accessed on 2014 Jul 05].
- Azzouz M, Boudiba A. Metabolic syndrome in Algiers population. 7<sup>th</sup> Pan Arab Congress on Endocrinology and Diabetes. Rabat (Marocco) 2006, Poster N 1.
- Bessaoud K, Boudraa G, Deschamps I, Hors J, Benbouabdallah M, Touhami M. Epidemiology of juvenile insulin-dependent diabetes in Algeria (Wilaya of Oran). *Rev Epidemiol Sante Publique* 1990;38:91-9.
- Dali-Sahi M, Benmansour D, Aouar A, Karam N. Type 2 diabetes mellitus: Epidemiological study in inbred populations in West Algeria. *Leban Sci J* 2012;13:17-26.
- Belmokhtar F, Belmokhtar R, Dali-Sahi M, Charef M. Risk factors associated with type 2 diabetes mellitus in west region of Algeria, maghnia. *J Diabetes Metab* 2011;2:148.
- Chami MA, Belhadj M. Prevalence of diabetes mellitus in old people living in Sidi Bellabes (West Algeria). *Diabetes Metab* 2013;39 Suppl 1:A107.
- Alzahrani SH, Hess K, Price JF, Strachan M, Baxter PD, Cubbon R, *et al.* Gender-specific alterations in fibrin structure function in type 2 diabetes: Associations with cardiometabolic and vascular markers. *J Clin Endocrinol Metab* 2012;97:E2282-7.
- Souaber H. Women's Activity in Algeria. Available from: <http://www.ciddef-dz.com/pdf/revues/revue-10/activite-feminine-en-algerie.pdf>. [Last accessed on 2014 Jul 05].
- Malek R, Belateche F, Laouamri S, Hamdi-Cherif M, Touabti A, Bendib W, *et al.* Prevalence of type 2 diabetes mellitus and glucose intolerance in the Setif area (Algeria). *Diabetes Metab* 2001;27:164-71.
- Zaoui S, Biémont C, Meguenni K. Epidemiology of diabetes in urban and rural regions of Tlemcen (Western Algeria). *Sante* 2007;17:15-21.
- Mennen LI, Mbanya JC, Cade J, Balkau B, Sharma S, Chungong S, *et al.* The habitual diet in rural and urban Cameroon. *Eur J Clin Nutr* 2000;54:150-4.
- Latifa BH, Kaouel M. Cardiovascular risk factors in Tlemcen (Algeria). *Sante* 2007;17:153-8.
- Atek M, Traissac P, El Ati J, Laid Y, Aounallah-Skhiri H, Eymard-Duvernay S, *et al.* Obesity and association with area of residence, gender and socio-economic factors in Algerian and Tunisian adults. *PLoS One* 2013;8:e75640.
- Laissaoui A, Allem R. Diabetes Mellitus Prevalence in Ain Defla (Algeria) 9<sup>th</sup> Maghreb Congress of Endocrinology and Diabetology 23-15 Nov, 2012.
- Bautista-Castaño I, Henriquez-Sanchez P, Alemán-Perez N, García-Salvador JJ, González-Quesada A, García-Hernández JA, *et al.* Maternal obesity in early pregnancy and risk of adverse outcomes. *PLoS One* 2013;8:e80410.
- Dekkar N. Evolution and prospects in the practice of contraception in Algeria. *J Int Bioéthique* 2002;2002:59-71.
- Hazi R. Use of medicinal plants in the traditional treatment of diabetes mellitus. Available from: <http://www.dspace.univ-tlemcen.dz/handle/112/2035>. [Last accessed on 2014 Jul 05].
- Benotmane A, Mohammedi F, Ayad F, Kadi K, Azzouz A. Diabetic foot lesions: Etiologic and prognostic factors. *Diabetes Metab* 2000;26:113-7.
- Benotmane A, Mohammedi F, Ayad F, Kadi K, Medjbeur S, Azzouz A. Management of diabetic foot lesions in hospital: Costs and benefits. *Diabetes Metab* 2001;27:688-94.
- Benotmane A, Faraoun K, Mohammedi F, Amani ME, Benkhelifa T. Treatment of diabetic foot lesions in hospital: Results of 2 successive five-year periods, 1989-1993 and 1994-1998. *Diabetes Metab* 2004;30:245-50.
- Benbakhti S, Chabni N, Dakkar Z, Kandouci-Tani MS, Megenni K. Diabetes Foot: Prevalence and Complications Observed in a Department of Internal Medicine in Tlemcen (Algeria). 15<sup>th</sup> Algerian Congress of Diabetes Mellitus and Metabolism, Algiers the 22-24 Nov, 2013.
- Coronary Disease: Very Frequent in Algeria. *Midi libre* 24-04-2008. Available from: <http://www.djazair.com/fr/lemidi/804241202>. [Last accessed date 2014 Jul 05].
- Bellalem A, Amroune AA, Amiri L, Ayadi N, Maloum D. Epidemiology of ischemic stroke and classification of subtypes according to TOAST criteria in the area of Setif in Algeria. *Rev Neurol* 2007;163:18.
- Sadoudi-Yaker G. Contribution and Limitations of Exercise Testing in Screening for Silent Myocardial Ischemia Among Women with Diabetes Mellitus. PhD Thesis; University of Medicine, Algeria, 23<sup>rd</sup> Jan, 2013
- Passionate Relationship Between Algerian People and Sugar. Available from: <http://www.niarunblog.unblog.fr/consommateurs-et-prix-rapport-passionnel-des-algeriens-avec-le-sucre/>. [Last accessed on 2014 Jul 05].
- Belhadj M. The prevalence of Type 2 diabetes mellitus in Touaregs of South Algeria. *Diabetes Metab* 2003;29:298-302.
- Dexamethasone Sold in Grocery Stores. Available from: <http://www.djazair.com/fr/reflexion/20342>. [Last accessed on 2014 Jul 05].
- Hamida F, Attif ML, Temmar M, Bouafia M. Prevalence of type 2 diabetes in an oasis in southern Algeria. *Diabetes Metab* 2014;40:A58.
- Temmar M, Wafra G, Joly L, Kearney-Schwartz A, Youcef M, Bensalah S, *et al.* Elderly Algerian women lose their sex-advantage in terms of arterial stiffness and cardiovascular profile. *J Hypertens* 2013;31:2244-50.
- Boukli Hacène L. Associations of environmental risk factors with risk of coronary artery disease in Tlemcen (Algeria). *Ann Cardiol Angeiol (Paris)* 2010;59:205-8.
- Bajaj S, Jawad F, Islam N, Mahtab H, Bhattarai J, Shrestha D, *et al.* South Asian women with diabetes: Psychosocial challenges and management: Consensus statement. *Indian J Endocrinol Metab* 2013;17:548-62.

35. Koceir EA, Benbaïbeche H, Haffaf el M, Kacimi G, Oudjit B. Metabolic syndrome and hormonal interaction in obese and type 2 diabetic Algerian subject: The behavior eating disorder impact. *Ann Biol Clin (Paris)* 2009;67:315-23.
36. Saker M, Merzouk H, Merzouk SA, Ahmed SB, Narce M. Predictive Factors of Obesity and their Relationships to Dietary Intake in Schoolchildren in Western Algeria. *Maedica (Buchar)* 2011;6:90-9.
37. Oulamara H, Agli AN, Frelut ML. Changes in the prevalence of overweight, obesity and thinness in Algerian children between 2001 and 2006. *Int J Pediatr Obes* 2009;4:411-3.
38. Benmohammed K, Nguyen MT, Khensal S, Valensi P, Lezzar A. Arterial hypertension in overweight and obese Algerian adolescents: Role of abdominal adiposity. *Diabetes Metab* 2011;37:291-7.
39. Oulebsir N. Algerian Women are Getting Married Later and Having Less Children. *The Jeune Independant* the 9<sup>th</sup> December 2006. Available from: <http://www.algeria-watch.org/fr/article/femmes/celibat.htm>. [Last accessed on 2014 Jul 05].
40. Ziadi F. Some Misconceptions About Pregnancy in Women from North African Origin. *Ecarts d'identité – N 72-73* – page 37. Available from: <http://www.revues-plurielles.org>. [Last accessed on 2014 Jul 05].
41. Hossein-nezhad A, Holick MF. Vitamin D for health: A global perspective. *Mayo Clin Proc* 2013;88:720-55.
42. Djennane M, Lebbah S, Roux C, Djoudi H, Cavalier E, Souberbielle JC. Vitamin D status of schoolchildren in Northern Algeria, seasonal variations and determinants of vitamin D deficiency. *Osteoporos Int* 2014;25:1493-502.
43. Flink L, Mochari-Greenberger H, Mosca L. Gender differences in clinical outcomes among diabetic patients hospitalized for cardiovascular disease. *Am Heart J* 2013;165:972-8.

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