Effect of antidiabetic treatment and anthropometric factors on some biochemical parameters in women with type 2 diabetes and cardiovascular complications

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ABSTRACT

Diabetes is a group of diseases with common numerous features, increased blood glucose is by definition the most obvious point. Our goal is to study the impact of drugs and anthropometric factors on some serum parameters among a representative sample of diabetic women with cardiovascular complications in Mascara city (Algeria). 70 type 2 diabetic women participated in this study over a period of nine months (from August 2014 to April 2015) with a mean age of 61 ± 7 years. Our results indicate a dominance of patients in 66-70 age bracket, almost 75,7% of women are overweight and 22,9% are obese. The mean of waist circumference is 102 ± 9 that of hip circumference is 107 ± 16. The waist hip ratio is 0.97 ± 0.18, systolic blood pressure is an average of 128 ± 20 and diastolic blood pressure is 70 ± 10. About cardiovascular complications, 98,6% of patients have high blood pressure, 18,6% left ventricular hypertrophy, 5,7% coronary insufficiency, 12,9% have had myocardial infarction and 10% cerebrovascular accident. We have noted a significant dependency between biguanides and fasting serum glucose levels (P = 0.023) in the risk of error 5%, the results showed that the HbA1c is strongly depends on the treatment with fast acting insulin analog, with significance (P = 0.008), total cholesterol depends significantly on the use of Meglitinide (glinides) and the basal insulin analog with an estimated significance level was respectively (P = 0.022) and (P = 0.042). The results of the statistical analysis show a significant relationship between triglycerides and basal insulin analog (P = 0.032), a significant relationship exists also between urea, clearance and Meglitinide (glinides) with such degree of significance (P = 0.018) and (P = 0.021) respectively. A negative significant correlation between HbA1c and hip circumference (P = 0,004) and between microalbuminuria and hip circumference (P = 0,012), microalbuminuria and the waist hip ratio (P = 0,006).

Keywords: Diabetes, Oral antidiabetic, Insulin, Complications, Glycemic balance, Mascara
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INTRODUCTION

The type 2 diabetes also known as insulin-resistant diabetes remains one of the most common chronic diseases in the world. According to the statistics of WHO in 2014 Type 2 diabetes accounts for 90% of diabetes found in the world. This silent disease has common consequences: excess glucose in the blood and in vessel wall, affect the nerves and potentially all tissues of the human body [1]. There are two types of complications: microvascular diseases particularly affecting the kidneys, eyes and nerves, and macrovascular disease mainly affecting the cardiovascular system. These complications are observed early in in controlled diabetes [2].

Researches for new drugs to treat some diseases such as diabetes are carried out in Algeria; meanwhile, studying the effect of used medication in the case of diabetes for example remains few or no explored.

The objective of this study is to determine the effect of drugs and anthropometric factors on some biochemical parameters in women with type 2 diabetes and with cardiovascular complications.

EXPERIMENTAL SECTION

Patients and methods
It is a longitudinal, observational study conducted over a period of 9 months on a sample of 70 female volunteers with type 2 diabetes and cardiovascular complications. The sample was selected at the diabetic's house of "400 housing clinic" in Mascara city. Included patients were women diagnosed with type 2 diabetes characterized by a fasting glucose ≥ 1.26 g / l, at least for 5 years and had at least a cardiovascular complication, and the age between 35 and 70 years.

Biochemical assays were performed on blood samples of patients collected by venipuncture in the elbow after 12 hours of fasting. The blood glucose assay was performed according to an enzymatic method based on a calorimetric principle; HbA1c was assayed by enzymatic method. Determination of total cholesterol was carried by an enzymatic technique based on the use of chromogenic substrate, the HDL fraction was analyzed using the kit liquicolor Cholesterol, LDL cholesterol was calculated using the Friedewald formula, and determination of triglycerides was carried out by the colorimetric enzymatic method with lipids suppression factor (LCF) according to kit guidelines. Urea and creatinine were measured as previously described, and clearance was calculated using the Cockroft & Gault formula.

Statistical analysis was carried out with SPSS 20. (Statistical Package for the Social Sciences, IBM Corporation, Chicago, IL August 2011.). Relations between Quantitative variables were analyzed by Pearson Correlation test. As for categorical variables the ANOVA test for one factor was performed.

RESULTS

In total 70 diabetic patients were enrolled in the present study, with age of 61 ± 7 years (Fig.1.). In average, patients had 8 ± 4 years as diabetic. The average weight was 71 ± 10 Kg, BMI was on average 27 ± 4.

Table 01. Distribution of patients according to their weight

	Frequency	Percent	Valid Percent	Cumulative Percent
Normal weight	1	1.4	1.4	1,4
overweight	53	75.7	75.7	77.1
obesity	16	22.9	22.9	100.0
Total	70	100.0	100.0	

Abdominal perimeter was 102 ± 9 that of Hip circumference was 107 ± 16. In addition, waist hip ratio was 0.97 ± 0.18. Regarding blood pressure, the systolic blood pressure was found to be of 128 ± 20 and diastolic blood pressure was 70 ± 10.
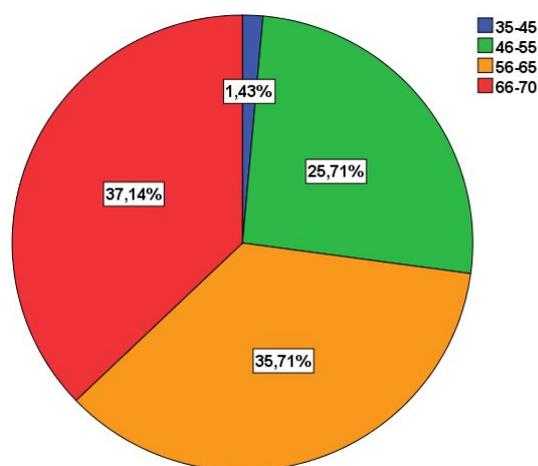

Fig.1. Distribution of patients according to their age
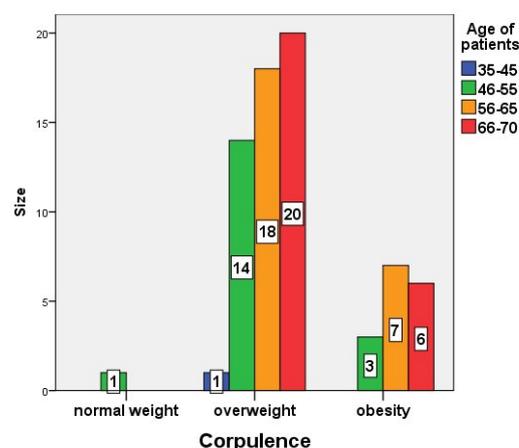

Fig.2. Corpulence of patients

Our results showed that proportion of different oral antidiabetics taken by patients was 94% with means: biguanides 1489 ± 586 (mg / d), 27% of sulfonamides with a dose of 1.25 ± 3.85 (mg / day), 20% of glinides with a dose of 0.62 ± 18 (mg / day) and 10% of inhibitor of alpha-glucosidase with a dose of 8.85 ± 29.21 (mg / day). Insulin use represented 12.9% for the basal insulin analog with a dose of 1.46 ± 14 (IU / day), mixed with 8.6% dosage of 3 ± 13 (IU / day), and fast acting insulin analog with a 1.4% dose of 10 ± 17 (IU / d). Furthermore, our results showed a significant dependency between biguanides use and fasting blood glucose levels (P = 0.023). Also, we noticed that HbA1c significantly depends on the fast acting insulin analog with significance. Similar dependences were found for total cholesterol and use of glinides and the basal insulin analog with an estimated significance level of 0.022 and 0.042, respectively. Statistical analysis showed a significant relationship between triglycerides and basal insulin analog (P = 0.032). A significant relationship exists also between urea, clearance and glinides with P = 0.018 and P = 0.021, respectively.

Table 02: Characteristics of blood components

Serum Parameter	FSG (g/l)	HbA1c (%)	TC (g/l)	HDL-C (g/l)	LDL-C (g/l)	TGs (g/l)	Urea	Créat	Claira	M.alb
Mean ± SD	1,34±0,5	7,53±1,7	1,69±0,4	0,45±0,1	1,01±0,4	1,20±0,5	0,96±4,3	10,50±7,3	94,86±69	17,3±17

Correlation between weight and fasting blood glucose was positive (P = 0.647) but not significant. Similarly weight and HbA1c were positively correlated (P = 0.457) but without statistical significance. On the other hand, correlation between HbA1c and hip circumference was negatively significant (P = 0.004) with a Pearson coefficient of (-0.343), and between HbA1c and waist hip ratio was positively significant (P = 0.003) with a Pearson coefficient of 0, 351. Our results show a negative significant correlation between hip circumference and microalbuminuria (P = 0.012) with a Pearson coefficient of (-0.300). We found also a significative negative correlation between microalbuminuria and the waist hip ratio (P = 0.006) with a Pearson coefficient of (-0.326).

DISCUSSION

According to 2014 statistics, 10% of Algerians are affected by diabetes. In comparison with the year 1992, the rate was only 2.1% of the population. Several causes could explain this fact such as physical inactivity, obesity and poor food hygiene (fat, sugar and salt).

The aim of the present work was to study the effect of antidiabetic treatment and anthropometric factors on some biochemical parameters in Algerian women with type 2 diabetes and cardiovascular complications, living in the region of Mascara (west Algeria). Complications among Algerian diabetic patients are not well understood.

Age of patients (women) included in our study ranged between 35 to 70 years. Age is considered as a non-modifiable risk factor in many epidemiological studies Unlike the US study of Todd Coffey *et al.* (2002) [3]. They demonstrated that age does not affect the quality of life of diabetic patients. It has been reported a female dominance of women in diabetic population in Tunisia explained by accumulation of risk factors (dyslipidemia, obesity) [4].

Table 03: Prevalence of cardiovascular complications

Cardiovascular complications	AHP	LVH	C.I	MI	CVA
Proportion (%)	98,6%	18,6%	5,7%	12,9%	10%

*AHP: Arterial high blood pressure, **LVH:** Left ventricular hypertrophy, **C.I:** Coronary insufficiency,*
***MI:** Myocardial infarction **CVA:** Cerebrovascular accident.*

We noticed that the age group of 66-70 years was predominant. This age is characterized by menopause and long term consequences of estrogen deficiency, resulting in a rise of cardiovascular diseases as demonstrated by the Framingham study [5]. It is interesting to mention that the characteristics presented by this population are those of metabolic syndrome according to the criteria of NCEP ATP III.

Diabetes complications are correlated with poor control of blood glucose [6]. Obesity, especially visceral obesity and severe obesity are an established risk factor for high blood pressure (hypertension), heart failure (CHF), coronary artery disease and cardiovascular mortality [7]. The average waist circumference in our population study was 102 ± 9 cm. According to the IDF criteria (> 80 cm in women), all patients are with abdominal obesity.

The data show a significant dependency between the biguanide and fasting blood sugar levels, The UKPDS [8] compared three classes of glucose-lowering drugs (sulfonylureas, metformin and insulin), but this study could not demonstrate the superiority of one therapy relative to the other, except metformin for cardiovascular complications. Besides the effects on blood glucose, oral medications may have other beneficial effects on cardiovascular risk factors such as blood pressure and dyslipidemia [9]. In line with those previously reported by Hartemann Heurtier *et al.* (2003) [10], HbA1c was highly dependent on insulin treatment with fast acting insulin analog. Total cholesterol was significantly dependent with the use of glinides and the basal insulin analog. Our findings are consistent with those obtained by Boudiba *et al*. (2013) [11]. Furthermore, we report here a significant relationship between triglycerides and basal insulin analog, which is in agreement with the study of Home *et al*. (2011) [12].

A significant relationship exists also between urea, clearance and glinides, confirming the results obtained by Chadli (2013) [13] that only glinides (repaglinide) are allowed to terminal IR stage and hemodialysis. Our findings about correlations between HbA1c and hip circumference and between HbA1c and waist hip confirm conclusions made by Gill *et al.* (2003) [14]. The results show a significant negative correlation between hip circumference and microalbuminuria ($P = .012$), ($P < 0.05$) with a Pearson coefficient equal to -0.300, the correlation between microalbuminuria and the waist hip ratio is negatively significant ($P = 0.006$),($P < 0.01$) with a Pearson coefficient equal to -0.326, according to Scheen and Van Gaal (2005) [15] Microalbuminuria is correlated with markers of the metabolic syndrome.

CONCLUSION

The present study gives evidence that in diabetic women living in Mascara city (Algeria) that use of biguanides (metformin) and glinides in mono or dual therapy, in association or without basal insulin analog or fast acting insulin analog contribute strongly to blood glucose control and improved biochemical profile. Furthermore, the waist hip ratio is as an essential anthropometric measure in assessing the balance of biochemical parameters in patients with type 2 diabetes.

Acknowledgments

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