

Prevalence and Incidence of Metabolic Syndrome in a Cohort of Patients with Rheumatoid Arthritis: A Correlation between Body Mass Index and Disease Activity

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Abstract

Rheumatoid Arthritis (RA) is an inflammatory disease associated with high morbidity and increased cardiovascular disease, and Metabolic Syndrome (MS) is understood as a set of metabolic disorders that correlates with obesity and sedentary lifestyle. The aim of this study is to evaluate the prevalence of MS in a cohort of patients with RA and its correlation to specific factors of the disease. A retrospective cohort study was conducted with 283 patients with RA, followed at the Rheumatology Outpatient Clinic of the Hospital de Clínicas de Porto Alegre (HCPA) between 2008 and 2016; 187 continued to be followed and agreed to be reevaluated between January and November 2016. MS was defined according to the National Cholesterol Education Program and disease activity was assessed using the Disease Activity Score (DAS28). Clinical, biochemical, and anthropometric evaluations were conducted. The prevalence of MS in the first evaluation was 43.9% and, after 8 years, 59.4%. Increased waist circumference and blood pressures, elevated triglycerides and low High-Density Lipoprotein were the most frequent features of MS. The DAS28 was significantly lower in the reevaluation ($p = 0.006$). The prevalence of MS was higher at the end of 8 years; disease activity, as well as blood pressure, decreased during this period. Steroid use had also decreased at the end of follow-up. There was an increase of 15% of cases with MS in an 8-year follow-up cohort of patients, which was in agreement with the current literature and showed how the inflammatory process in RA is correlated to MS. The parameters of MS that varied the most were blood pressure, cholesterol and triglycerides. Ultimately, these parameters and disease activity must be observed closely in order to improve the prognosis of patients with RA.

Keywords

Rheumatoid Arthritis, Metabolic Syndrome, Medical Treatment, Body Mass Index, Disease Activity

1. Introduction

Rheumatoid Arthritis (RA) is a systemic inflammatory disease that may cause destruction and deformity of the joints and lead to a functional disability whenever it's not properly treated. Patients with RA, especially those with an active disease, have shown a tendency to present abnormal lipid profile with low levels of high-density lipoprotein cholesterol (HDL) and high levels of triglycerides, as well as less insulin sensitivity. These clinical and laboratory findings, along with central obesity and increased blood pressure, embrace the concept of metabolic syndrome (MS), which accelerates the process of atherosclerosis and inflammation in RA patients, duplicating the risk of fatal and non-fatal cardiovascular events [1] [2] [3] [4].

Accordingly, RA and MS are considered diseases with common characteristics that may increase the risk of cardiovascular disease. Higher rates of insulin resistance and MS have been reported in patients with RA, with the rate of MS found in RA patients ranging from 14% to 56%. This wide variation can be explained by the disparity among the multiple definitions of MS, as well as differences in ethnicity, geographical area, study design and population studied [5].

The aim of the treatment for RA is remission. Moreover, the pillar treatment of synthetic or biological disease-modifying antirheumatic drugs (DMARDs) is the main responsible for reducing or reversing signs and symptoms that interfere with quality of life, disability and progression of joint damage [6]. Appropriate management may enable lower rates of disease activity, resulting in increased functional capacity and better quality of life. Early diagnosis and treatment of RA can also decrease the risk factors for MS, improving quality of life and life expectancy [6].

The aim of this study was to evaluate the components of MS in patients with RA during a long-term follow-up, as well as to correlate the variation with clinical and laboratory parameters of the disease.

2. Methods

2.1. Patients and Study Design

A retrospective cohort of 283 RA patients previously described in Cunha *et al.* [7] was followed at the Rheumatology Outpatient Clinic of the Hospital de Clínicas de Porto Alegre (HCPA) between 2008 and 2016. All of them fulfilled the criteria of the American College of Rheumatology (ACR) for AR and were aged at least 18 years. Patients with another connective tissue disease (except for secondary Sjögren's syndrome) were excluded. Among them, 187 subjects were

reevaluated between January and November 2016.

MS was defined according to the National Cholesterol Education Program's Adult Treatment Panel (NCEP-ATP III) criteria [8].

Disease activity was assessed using the Disease Activity Score (DAS-28). In addition, clinical, biochemical and anthropometric evaluations were applied. In order to avoid evaluation bias in subjective variables, such as DAS-28 and measurements of the hip and abdomen circumferences, the same researcher examined the patients during follow-up. The diagnostic criteria was the same as those assessed by Cunha [7], according to the American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) criteria [6].

The study was submitted and evaluated by the Research and Graduation Group (GPPG) and by the Internal Review Board of the HCPA, meeting their norms and guidelines. Since it was a new research with different researchers, all the participants signed a new informed consent form contemplating the current regulations.

2.2. Assessment

The patients were scheduled for evaluation, by two different trained researchers at both times, and following the protocol established: clinical, anthropometric, biochemical evaluation; blood pressure measurement; assessment of disease activity.

Clinical evaluation: A questionnaire designed by the authors of Cunha *et al.* [7] was completed about age, time since diagnosis, current medications and previous diagnosis of cardiovascular disease (CVD)—angina, acute myocardial infarction and stroke. Blood pressure (BP) was registered as the mean of two consecutive measurements, before and after the interview. It is available at the Supplementary Appendix.

Anthropometric evaluation: Weight was registered in kilograms (kg) and height in meters (m). The measurements were carried out as recommended by the World Health Organization [9]. Weight and height were used to calculate the Body Mass Index (BMI) = Weight/Height², classified according to the WHO [10]. Waist Circumference (WC) was measured between the anterior superior iliac spine and the last rib. The measuring instrument used was in centimeters presenting variation of the scale in millimeters (mm) [11].

Laboratory Tests: Total Cholesterol, HDL-c, Triglycerides, Fasting Glucose, Fasting Insulin and ultrasensitive C-Reactive Protein (CRP) were tested in the clinical laboratory of the HCPA. LDL-c was obtained by the Friedewald formula: $LDL-c = (TC - HDL-c - TG/5)$; when serum TG < 400 mg/dl [10]. Insulin resistance (IR) was assessed by calculating the HOMA index = fasting glucose × 0.0555 × fasting insulin/22.59 and the result was considered positive when >2.114 [12], only when TG > 400 mg/dl.

RA Activity: According to the Disease Activity Score-28 (DAS-28), an instrument dedicated to evaluating disease activity, activity is considered high when the result is >5.1; moderate between 3.2 and 5.1; low ≤ 3.2, and remission when

≤ 2.6 [13]. DAS-28 was calculated using erythrocyte sedimentation rate (ESR) and four variables (tender joints, swollen joints, ESR and visual analog scale or VAS).

Diagnosis of MS: The NCEP ATPIII⁷ criteria were adopted. It required the presence of three or more of the following conditions: waist circumference > 102 cm in men or >88 cm in women, high density lipoprotein cholesterol (HDL-C) < 50 mg/dL in women and <40 mg/dL in men or on drug treatment, triglycerides 150 mg/dL or on drug treatment, blood pressure (BP) $130/85$ mmHg or on anti-hypertensive treatment, and fasting glucose 100 mg/dL or on anti-diabetic drug treatment.

Medications: The use of Disease-Modifying Anti-Rheumatic Drugs (DMARDs) was evaluated retrospectively by the patients' medical records and direct interviews.

2.3. Potential Bias

In order to avoid evaluation bias for the variables of higher subjectivity, such as DAS-28 and measurements of the hip and abdomen circumferences, the same investigator assessed the patient in 2008 and 2016.

2.4. Statistical Analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0. $P \leq 0.05$ was considered significant.

The normality of the quantitative variables was verified using the Kolmogorov-Smirnov test, for the definition of parametric or non-parametric results. The deltas of the studied variables were constructed using the difference between the two evaluations.

Qualitative variables were determined by absolute and relative frequency, while quantitative variables were determined by the mean and standard deviation or interquartile range and median.

In order to compare the time-points (1st and 2nd evaluations) of the variables, the Student's t-test was used for paired samples. In case of asymmetry, the Wilcoxon test was applied. For categorical variables, the McNemar test was used.

So as to compare means among the four groups of Metabolic Syndrome, the One-way Analysis of Variance (ANOVA) in conjunction with the Tukey's range test was applied. In case of asymmetry, the Kruskal-Wallis and Dunn tests were used, respectively. For the comparison of categorical variables, Pearson's chi-square test was applied.

Pearson's correlation was carried out in order to verify the degree of correlation among the variables.

For the correction of confounding factors (age at 1st evaluation, gender, BMI variation, CRP at 1st evaluation, DAS-28 at 1st evaluation, HAQ at 1st evaluation, use of prednisone at 1st evaluation and dose of prednisone at 1st evaluation), multivariate Poisson Regression analysis was used. A p value < 0.20 in the biva-

riate analysis met the criteria to enter the variable in the multivariate model.

For this study, no sample size calculation was performed because the same patients from the cohort studied by Cunha *et al.* [7] were reevaluated, verifying the same data and current laboratory tests.

3. Compliance with Ethical Standards

3.1. Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

This study was approved to the local Ethics Committee of Hospital de Clínicas de Porto Alegre number 2014-0602.

3.2. Informed Consent

Informed consent was obtained from all participants included in the study.

4. Results

Among the 187 patients evaluated, 29 (15.5%) were men and 158 (84.5%), women. The mean age at onset was 53.5 years; the sample was mostly of Caucasians (85%); and they mostly presented a low level of education (complete or incomplete Elementary School: 72%). The sample characteristics are described in **Table 1**.

When we evaluated the risk factors for MS (**Table 2**), we noted a statistically significant reduction in disease activity according to DAS-28 (3.87 ± 1.43 vs. 3.52 ± 1.36 , $p = 0.006$), HDL levels (58.7 ± 16.1 mg/dL vs. 55.22 ± 15.7 , $p < 0.001$) and blood pressure (Systolic Blood Pressure: 139.1 ± 23.5 mmHg vs. 130.6 ± 24.9 , $p < 0.001$; Diastolic Blood Pressure: 85.9 ± 12.6 mmHg vs. 82.5 ± 12.0 , $p < 0.001$). There was, however, significant increase in glucose levels (93.9 mg/dL ± 20.9 vs. 97.7 ± 29.1 , $p = 0.042$) and in the prevalence of metabolic syndrome (MS) (43.9% vs. 59.4%, $p < 0.001$).

When the medication-related aspects were evaluated (**Table 3**), a statistically significant reduction was noted in the use and dosage of prednisone (55.6% vs. 39%, $p < 0.001$) and in the use of chloroquine diphosphate (17.6% vs. 3.7%, $p < 0.001$). Significant increase in the use of leflunomide (23% vs. 40.6%, $p < 0.001$) and biologicals (2.7% vs. 18.2%, $p < 0.001$) was also noted.

After follow-up, only nine patients (4.8%) no longer had metabolic syndrome. However, 38 (20.3%) did not present MS in the 1st evaluation and presented it in the second evaluation. The remaining patients (approximately 75%) had no changes in their clinical condition at follow-up, either remaining with no MS (35.8%) or persisting with MS (39%).

When the variables were associated with changes in MS (**Table 4**), a significant association with age was noted ($p = 0.008$). Younger patients had no MS at

Table 1. Demographic data.

Variables	N = 187
Age at 1st evaluation (years)-mean \pm SD	53.9 \pm 11.0
Age at 2nd evaluation (years)-mean \pm SD	61.4 \pm 10.9
Gender-n (%)	
Male	29 (15.5)
Female	158 (84.5)
Ethnicity-n (%)	
White	159 (85.0)
Black	20 (10.7)
Mixed	6 (3.2)
Education-n (%)	
Illiterate	2 (1.1)
Incomplete Elementary School	94 (50.3)
Complete Elementary School	41 (21.9)
Incomplete High School	11 (5.9)
Complete High School	21 (11.2)
Incomplete University Degree	1 (0.5)
Complete University Degree	5 (2.7)
Post-graduation	12 (6.4)
Age at diagnosis (years)-mean \pm SD	53.5 \pm 11.4

Table 2. Comparison of RA patients regarding distribution of components, disease activity, and prevalence of MS through time.

Variables	1 st evaluation (n = 187)	2 nd evaluation (n = 187)	P
HDL (mg/dL)	58.7 \pm 16.1	55.2 \pm 15.7	<0.001
Triglycerides (mg/dL)	127.7 \pm 57.0	134.8 \pm 59.8	0.067
Glucose (mg/dL)	93.9 \pm 20.9	97.7 \pm 29.1	0.042
BMI (kg/m ²)	26.9 \pm 5.1	27.3 \pm 5.2	0.069
Waist circumference (cm)	92.9 \pm 13.1	92.3 \pm 14.1	0.252
Systolic Blood Pressure (mmHg)	139.1 \pm 23.5	130.6 \pm 24.9	<0.001
Diastolic Blood Pressure (mmHg)	85.9 \pm 12.6	82.5 \pm 12.0	<0.001
CRP (mg/dL)	5.5 (0.16 - 161)	5.4 (0.75 - 73.9)	0.069
DAS-28	3.87 \pm 1.43	3.52 \pm 1.36	0.006
Moderate/high disease activity (>3.2)	126 (67.4)	101 (54.0)	0.006
HAQ	1.1 (0.5 - 1.6)	1.1 (0.4 - 1.6)	0.990
MS (%)	82 (43.9)	111 (59.4)	<0.001

Mean \pm SD, except for minimum-maximum or IQR in CRP and HAQ, respectively.

Table 3. Drug use during follow-up.

Variables	1 st evaluation (n = 187)	2 nd evaluation (n = 187)	P
Use of Prednisone	104 (55.6)	73 (39.0)	<0.001
Dosage of Prednisone (mg)	5 (0 - 10)	0 (0 - 5)	<0.001
Methotrexate	152 (81.3)	140 (74.9)	0.096
Dosage of Methotrexate (mg)	15 (10 - 20)	15 (10 - 20)	0.002
Hydroxychloroquine	18 (9.6)	10 (5.3)	0.096
Hydroxychloroquine diphosphate	33 (17.6)	7 (3.7)	<0.001
Sulphasalazine	16 (8.6)	11 (5.9)	0.424
Leflunomide	43 (23.0)	76 (40.6)	<0.001
Biologicals	5 (2.7)	34 (18.2)	<0.001
Use of Prednisone	104 (55.6)	73 (39.0)	<0.001
Dose of Prednisone (mg)	5 (0 - 10)	0 (0 - 5)	<0.001

Mean and IIQ for quantitative variables and n (%) for qualitative variables.

Table 4. Clinical characteristics and association with MS.

Variables*	MS absent in both evaluations (n = 67)	MS present in the 1 st evaluation and absent in the 2 nd (n = 9)	MS absent in the 1 st evaluation and present in the 2 nd (n = 38)	MS present in both evaluations (n = 73)	P
Age at 1 st evaluation (years)	51.5 ± 12.6 ^a	60.2 ± 8.6 ^{ab}	51.9 ± 9.6 ^a	56.5 ± 9.7 ^b	0.008
Gender					0.074
Male	16 (23.9)	1 (11.1)	2 (5.3)	10 (13.7)	
Female	51 (76.1)	8 (88.9)	36 (94.7)	63 (83.6)	
BMI					
1 st evaluation	24.4 ± 4.2 ^a	27.3 ± 6.0 ^{ab}	26.1 ± 3.1 ^a	29.7 ± 5.3 ^b	<0.001
2 nd evaluation	25.4 ± 5.3 ^a	26.9 ± 6.1 ^{ab}	27.5 ± 3.8 ^{ab}	29.1 ± 5.2 ^b	<0.001
Delta	1.01 ± 2.56 ^b	-0.41 ± 2.64 ^{ab}	1.38 ± 3.31 ^b	-0.59 ± 2.81 ^a	0.001
DAS-28					
1 st evaluation	3.5 ± 1.5 ^a	3.6 ± 1.4 ^{ab}	4.3 ± 1.5 ^b	4.0 ± 1.3 ^{ab}	0.032
2 nd evaluation	3.3 ± 1.3	4.5 ± 2.4	3.7 ± 1.1	3.5 ± 1.3	0.052
Delta	-0.2 ± 1.7	0.9 ± 2.4	-0.6 ± 1.6	-0.5 ± 1.6	0.076
Moderate/high disease activity (>3.2)					
1 st evaluation	38 (56.7)	6 (66.7)	31 (81.6)	51 (69.9)	0.067
2 nd evaluation	32 (47.8)	6 (66.7)	25 (65.8)	38 (52.1)	0.276
Dose of Prednisone					
1 st evaluation	5 (0 - 10) ^{ab}	0 (0 - 6.3) ^a	10 (0 - 10) ^b	0 (0 - 10) ^a	0.031
2 nd evaluation	0 (0 - 5)	0 (0 - 3.2)	0 (0 - 5.6)	0 (0 - 5)	0.506
Delta	0.0 (-1.0 - 0.0)	0 (0 - 0)	0.0 (-1.0 - 0.0)	0.0 (0.0 - 0.0)	0.539

The letters (a, b and ab) have the following meanings: a is different from b (significant difference); ab does not differ from either a or b.

the first evaluation (in spite of having developed or not MS at the second evaluation). It was also noted that patients who remained with MS in both evaluations were those with the highest BMI in both the first and second evaluations (29.7 ± 5.3 and 29.1 ± 5.2 mg/k², respectively, $p > 0.05$). There was a significant increase in BMI in those patients who did not have MS and developed it during the follow-up period (26.1 ± 3.1 and 27.5 ± 3.8 , delta 1.38 ± 3.31 , $p < 0.05$). In this group, DAS-28 was significantly higher, as well as the dose of prednisone.

Since the group that developed MS along the follow-up presented significant differences in the analyzes of **Table 4**, a multivariate model was conducted in order to investigate possible risk factors for this specific condition, considering that the group that improved (no longer had MS) had a very small number of patients ($n = 9$). After adjustment by the multivariate model, significance remained for these following outcomes: variation of BMI (RR 1.12, 95% CI 1.02 - 1.23, $p = 0.018$), CRP (RR 1.01, 95% CI 1.00 - 1.02, $P = 0.001$), DAS-28 (RR 2.15, 95% CI 1.03 - 4.48, $p = 0.041$) and dose of prednisone in the 1st evaluation (RR 1.05, 95% CI 1.02 - 1.08, $p = 0.001$) (**Table 5**).

For patients who increased 1 kg/m² in BMI after eight years of follow-up, there was a 12% increase in the incidence of MS. Although CRP showed statistical significance, it did not remain significant when the 95% CI was considered. In addition, patients who had moderate/high disease activity in the 1st evaluation had 115% increased risk of developing MS, even though it has to be considered that the confidence interval was quite wide (95% CI 1.03 - 4.48, $p = 0.041$). Finally, with each increase of one unit in the dose of prednisone taken in the 1st evaluation, there was a 5% increase in the chance of developing MS.

When comparing the use of drugs with the improvement of the disease activity, only the use of biological drugs was significantly associated with improvement in DAS-28 scores from the 1st to the 2nd evaluation ($p = 0.041$). Improvement was

Table 5. Multivariate Poisson Regression analysis to evaluate independent factors associated with MS.

Variables	Relative Risk (RR)	95% CI	*P value
Age at 1 st evaluation (years)	1.01	0.99 - 1.03	0.566
Gender			
Male	1.00		
Female	3.18	0.75 - 13.5	0.116
BMI (Variation)	1.12	1.02 - 1.23	0.018
CRP 1 st evaluation	1.01	1.00 - 1.02	0.001
DAS-28 (Moderate/high activity) 1 st evaluation	2.15	1.03 - 4.48	0.041
HAQ 1 st evaluation	0.71	0.46 - 1.08	0.110
Use of Prednisone 1 st evaluation	1.41	0.81 - 2.48	0.226
Dose of Prednisone 1 st evaluation	1.05	1.02 - 1.08	0.001

For the correction of confounding factors, a p value < 0.20 in the bivariate analysis met the criterion to enter the variable in the multivariate model.

found in 79.4% of those using biologicals versus 58.8% in patients who did not use. For the other medications, the differences were not significant ($p > 0.05$).

5. Discussion

RA and MS are considered diseases with shared characteristics that may increase the risk of cardiovascular diseases [13]. Researchers, therefore, focus their studies on the prevalence of MS in RA patients. We followed patients with RA and manifestations of MS for a period of 8 years, finding a 15% increase in the prevalence of MS, associated with parameters of disease activity, use of steroid and BMI.

Our results are consistent with previous studies with similar demographic profiles. Tantayakom *et al.* [14], between 2011 and 2015, also analyzed clinical and laboratory data of 267 patients with RA and MS according to the NCEP ATP III; 88% of the sample were women with mean age and standard deviation equal to 59 ± 11.1 years. In another study with 91 subjects with early AR and high rates of MS (35.2%), Muller *et al.* [14] found a correlation between age and gender, where the mean age was 52 years and 72.5% of the sample were women.

The correlation between RA and MS has been widely studied and the prevalence of MS in RA patients is higher when compared to the general population [13] [14] [15] [16] [17]. An Argentinian study [18] has evaluated the prevalence and correlation of MS with RA in 409 patients, and found a frequency of 30% according to the NCEP ATP III criteria and 35% according to the IDF criteria. Abourazzak *et al.* [19] investigated for a period of 17 months the prevalence of MS in Morocco in 179 patients with RA. The prevalence of MS in RA patients ranged from 24.6% to 30.7%, according to the definitions used (NCEP ATP III, IDF and American Association of Clinical Endocrinologists). A cross-sectional study conducted in the Northeastern Region of Brazil [20], with 110 patients with RA, showed a prevalence of MS of 50%, according to the NCEP ATP III criteria, and 53.4% according to the IDF. In a cohort with 384 Pakistani patients with RA [15], followed between July 2014 and June 2015, MS was found in 120 (31.3%), by the NCEP ATP III criteria. Our results, following the IDF criteria, determined that 31.55% patients had MS, in accordance with the international literature.

The study shows a wide range in the prevalence of MS in patients with RA. However, these values are consonant with the global prevalence that is estimated between 14% and 63%, justified by differences in epidemiology and methodology, such as the characteristics of the studied population, the origin of the patients, the criteria used to determine MS and the study design.

Since patients with RA have a higher prevalence of MS, management must be effective, reducing the possibility of cardiovascular diseases. In our study, we found a correlation between cholesterol and triglycerides levels and between systolic and diastolic blood pressures, which may further increase the risks of morbidity and mortality in these patients.

The correlations found and described in **Table 2** are as expected, although they are weak or moderate correlations. This has most likely occurred because factors that were not evaluated may have influenced the results.

Disease activity is considered a factor that may increase the incidence of MS in patients with RA and is often mentioned in studies [21] [22] [23] [24] [25]. Among our patients, the disease activity at follow-up, based on DAS-28 [26], decreased from 3.88 ± 1.4 to 3.54 ± 1.35 and was statistically significant ($p < 0.006$), although it did not decrease to low activity or remission.

The main limitations of this study were the lack of a comparator group and the fact that the use of cardiovascular drugs was not evaluated.

After an 8-year follow-up, there was an increase of 15% in the number of cases with MS in this cohort of patients with established RA. Therefore, our study is consistent with the literature and shows the actual magnitude of MS in patients with established RA. It also represents the parameters in MS that vary in the population of RA patients, such as blood pressure, cholesterol and triglycerides. Consequently, it is imperative that we prevent the continuous inflammatory process and appropriately manage these parameters in order to have a better prognosis.

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Conflicts of Interest

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

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Research Protocol

**Hospital de Clínicas de Porto Alegre-Department of Rheumatology
Prevalence and Incidence of Metabolic Syndrome in a Cohort of Patients
with Rheumatoid Arthritis: a correlation with Body Mass Index and Disease
Activity**

Day/Month/Year: ____/____/____

CLINICAL EVALUATION

Patient's name: _____ Medical record: _____

Age: ____ years Birthday date: ____/____/____ Sex: () F () M

Years of disease since diagnostic: _____

Current medications: _____

Previous diagnosis of CVD:

() angina () acute myocardial infarction () stroke

BIOCHEMICAL EVALUATION:

Sample date: ____/____/____

Evaluation	Results
Total Cholesterol	
HDL	
LDL	
Triglycerides	
Fasting Glucose	
Fasting insulin	
Ultrasensitive CRP	
Free T4	
Ultrasensitive TSH	

ANTHROPOMETRIC EVALUATION

Weight: _____ kg

Height: _____ cm

BMI: _____ kg/m²

Waist Circumference: _____ cm

BLOOD PRESSURE MEASURES

BP: ____/____ mmHg—1st verification

BP: ____/____ mmHg—2nd verification

BP: ____/____ mmHg – mean

METABOLIC SYNDROME DIAGNOSIS

Waist Circumference	>88 cm women >102 cm men
Triglycerides	≥150 mg/dL or on medication
HDL-c	<50 mg/dL women <40 mg/dL men or on medication
Blood Pressure	≥130 and/or 85 mmHg Oronmedication
Fasting Glucose	≥100 mg/dL Oronmedication
