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ORIGINAL ARTICLE

# World Health Organization cardiovascular risk stratification and target organ damage

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**KEYWORDS**
Hypertension;
Risk stratification;
Target organ damage;
Left ventricular hypertrophy;
Left ventricular dysfunction

**Abstract**
*Background:* Prediction charts allow treatment to be targeted according to simple markers of cardiovascular risk; many algorithms do not recommend screening asymptomatic target organ damage which could change dramatically the assessment.
*Objective:* To demonstrate that target organ damage is present in low cardiovascular risk hypertensive patients and it is more frequent and severe as global cardiovascular risk increases.
*Methods:* Consecutive hypertensive patients treated at a single Latin American center. Cardiovascular risk stratified according to 2013 WHO/ISH risk prediction chart America B. Left ventricular mass assessed by Devereux method, left ventricular hypertrophy considered >95 g/m$^2$ in women and >115 g/m$^2$ in men. Transmitral diastolic peak early flow velocity to average septal/lateral peak early diastolic relaxation velocity (E/e' ratio) measured cut off value >13. Systolic function assessed by tissue Doppler average interventricular septum/lateral wall mitral annulus rate systolic excursion (s wave).
*Results:* A total of 292 patients were included of whom 159 patients (54.5%) had cardiovascular risk of <10%, 90 (30.8%) had cardiovascular risk of 10–20% and 43 (14.7%) had cardiovascular risk of >20%. Left ventricular hypertrophy was detected in 17.6% low risk patients, 27.8% in medium risk and 23.3% in high risk ($p < 0.05$), abnormal E/e' ratio was found in 13.8%, 31.1% and 27.9%, respectively ($p < 0.05$). Mean s wave was 8.03 + 8, 8.1 + 9 and 8.7 + 1 cm/s for low, intermediate and high risk patients, respectively ($p < 0.025$).
*Conclusions:* Target organ damage is more frequent and severe in high risk; one over four subjects was misclassified due to the presence of asymptomatic target organ damage.


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**PALABRAS CLAVE**
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Estratificación riesgo;
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Hipertrofia ventricular izquierda;
Disfunción ventricular izquierda

**Estratificación del riesgo cardiovascular de la Organización Mundial de la Salud y daño en órgano blanco**

**Resumen**
*Antecedentes:* Las tablas de riesgo cardiovascular dirigen el tratamiento según marcadores clínicos sencillos. Muchos algoritmos no recomiendan el cribado rutinario del daño de órgano blanco asintomático que podría cambiar drásticamente la estratificación.
*Objetivos:* Demostrar que el daño en órgano blanco es altamente prevalente en el bajo riesgo cardiovascular y más frecuente y severo en la medida en que este aumenta.
*Material y métodos:* Un total de 292 pacientes hipertensos consecutivos no tratados en un único centro latinoamericano. Riesgo cardiovascular estratificado según Guía 2013 OMS/ISH América B. Masa ventricular izquierda evaluada por método de Devereux, hipertrofia ventricular izquierda >95 g/m$^2$ mujeres y >115 g/m$^2$ hombres. Se midió relación velocidad pico diastólico transmitral con doppler y velocidad diastólica precoz septal y lateral del anillo mitral con doppler tisular (relación E/e′), valor de corte >13. Función sistólica evaluada por doppler tisular como tasa de excursión tabique interventricular y pared lateral (onda s).
*Resultados:* Un total de 159 pacientes (54,5%) presentaron riesgo cardiovascular <10%; 90 (30,8%) riesgo cardiovascular entre el 10% y el <20% y 43 (14,7%) presentaron un riesgo cardiovascular >20%. La hipertrofia ventricular izquierda en 17,6% pacientes fue de bajo riesgo, en el 27,8% de riesgo intermedio y en el 23,3% de alto riesgo ($p < 0,05$), con relación E/e′ anormal 13,8; 31,1 y 27,9%, respectivamente ($p < 0,05$). La onda s promedio fue de 8,03 + 8 ; 8,1 + 9 ; y 8,7 + 1 cm/seg para riesgo bajo, intermedio y alto, respectivamente ($p < 0,025$).
*Conclusiones:* El daño en órgano blanco fue más frecuente y severo en alto riesgo; uno de cada 4 sujetos fue clasificado erróneamente debido a presencia de daño en órgano blanco subclínico.


## Introduction

The relationship between office and out of office blood pressure to the incidence of vascular events is well documented in a large amount of epidemiological studies.[1–3] Moreover the integration of these blood pressure values to other risk factors, metabolic conditions, target organ damage and cardiovascular and renal complications is recommended in cardiovascular prevention guidelines as a tool to establish the individual patient prognostic.[4,5] This global cardiovascular risk approach is universally accepted in our days and has a great impact on the antihypertensive treatment strategy as well as on the indication of antiplatelet and lipid lowering treatment. On the other side, the availability of appropriate facilities and human resources to perform the evaluation of target organ damage is a well-recognized limitation. In this context, the global cardiovascular risk assessment score should be as simple as possible and with minimal technological resources requirements to be applied in clinical settings. At the same time, the presence of target organ damage is a determinant of global cardiovascular risk but on the other side an intermediate stage in the hypertensive disease continuum.[6,7] The World Health Organization published the Guideline for assessment and management of cardiovascular risk which aim was to reduce disability and premature cardiovascular deaths in people at high cardiovascular risk without a previous event, and it is accompanied by the WHO/ISH risk prediction charts that allow treatment to be targeted according to simple predictions of absolute cardiovascular risk. This algorithm considers sex, age, smoking habit, diabetes history, office blood pressure and plasmatic total cholesterol and with this data the subject is assigned to one of the four categories according to the 10 years cardiovascular risk (CVR) level.[8]

In this study it was hypothesized that low cardiovascular risk patients have a high prevalence of target organ damage and that the frequency and severity of target organ damage rise as well as cardiovascular risk level increase in hypertensive patients.

The aim of the present study is to demonstrate that target organ damage is highly prevalent in low cardiovascular risk hypertensive patients but it is more frequent and severe as global cardiovascular risk increases according to WHO/ISH risk prediction chart.

## Methods

This is a descriptive cross-sectional study, with a prospectively collected sample conducted at the Cardiology Institute of the British Sanatorium at Rosario city, Argentina. The study has been carried out in accordance with the Code of Ethics of the World Medical Association for experiments involving humans.

Inclusion criteria were: (1) non treated essential arterial hypertensive patients over 18 years of age of both sexes at their first consultation, (2) 2D and M Mode echocardiography, mitral Doppler and tissue Doppler of sufficient quality to perform the calculation of the LV mass and evaluate LV diastolic and systolic function. Exclusion criteria were: (1) clinical cardiovascular disease that could impact