



REVIEW ARTICLE

Epidemiological research on the incidence and prevalence of hypertension in the Portuguese population: A scoping review[☆]



Mafalda Sousa Uva^{*}, Paulo Victorino, Rita Roquette, Ausenda Machado, Carlos Matias Dias

Departamento de Epidemiologia, Instituto Nacional Doutor Ricardo Jorge, Lisboa, Portugal

Received 20 December 2013; accepted 2 February 2014

Available online 12 August 2014

KEYWORDS

Hypertension;
Prevalence;
Incidence;
Review;
Portugal

Abstract

Introduction and Objectives: Portugal is among the countries with the highest levels of mean blood pressure. The aim of the present study is to conduct a structured literature review describing the scope (quantity, focus and nature) of published epidemiological research on the prevalence and incidence of hypertension in the Portuguese population.

Methods: The scoping review was conducted during June 2013, using two information sources, B-on and PubMed, to search for published studies on the prevalence and incidence of hypertension with data collected between 2005–2013 and 1995–2013, respectively.

Results: We identified 527 publications, of which 14 on the prevalence and two on the incidence of hypertension were selected. The results show more studies on populations in the North region of Portugal; an apparent lack of published studies specifically targeting the Alentejo and Algarve populations; long delays between data collection and publication of results (up to nine years); considerable variability in measurement methods; and infrequent data stratification by gender and age.

Conclusions: Differences in blood pressure measurement methods, not specified in most studies, the infrequency of stratification of results by gender and age, and the geographic asymmetry in coverage of the Portuguese population, hinder monitoring of the incidence and prevalence of hypertension in Portugal.

© 2013 Sociedade Portuguesa de Cardiologia. Published by Elsevier España, S.L.U. All rights reserved.

[☆] Please cite this article as: Sousa-Uva M, Victorino P, Roquette R, et al. Investigação epidemiológica sobre prevalência e incidência de hipertensão arterial na população portuguesa – uma revisão de âmbito. Rev Port Cardiol. 2014;33:451–463.

^{*} Corresponding author.

E-mail address: mafalda.uva@insa.min-saude.pt (M.S. Uva).

PALAVRAS-CHAVE

Hipertensão arterial;
Prevalência;
Incidência;
Revisão;
Portugal

Investigação epidemiológica sobre prevalência e incidência de hipertensão arterial na população portuguesa – uma revisão de âmbito

Resumo

Introdução e objetivos: Portugal é referido na literatura como um dos países com maiores níveis de tensão arterial média na população. O objetivo do presente estudo é realizar uma revisão estruturada da literatura acerca do âmbito (quantidade, foco e natureza) da investigação epidemiológica publicada sobre prevalência e incidência de hipertensão arterial na população portuguesa.

Métodos: A revisão de âmbito foi realizada em junho de 2013. Através da consulta das fontes de informação Pubmed e B-on foram pesquisados estudos sobre prevalência e incidência de hipertensão arterial cuja recolha de dados tivesse decorrido, respetivamente, entre 2005-2013 e 1995-2013.

Resultados: Obtiveram-se 527 publicações, das quais foram selecionadas 14 sobre prevalência e duas sobre incidência de hipertensão. Os resultados indicam maior número de estudos sobre populações da região Norte do país; a aparente inexistência de estudos específicos sobre as populações do Alentejo e Algarve; longos períodos de tempo entre a recolha de dados e a publicação dos resultados (até nove anos); variabilidade apreciável nos métodos utilizados para medir a tensão arterial; e a infrequente desagregação dos resultados por sexo e idade.

Conclusões: Os diferentes métodos de medição da hipertensão arterial, omissos na maioria dos trabalhos analisados, a rara desagregação dos resultados por sexo e idade e a assimetria de cobertura geográfica da população dificultam a monitorização das tendências da frequência de hipertensão arterial em Portugal.

© 2013 Sociedade Portuguesa de Cardiologia. Publicado por Elsevier España, S.L.U. Todos os direitos reservados.

Introduction

Hypertension is the most important risk factor for cardiovascular and cerebrovascular disease, particularly myocardial infarction and stroke, which are major causes of morbidity and mortality throughout the world.¹⁻³ In 2008, the global prevalence of hypertension in adults aged ≥ 25 years was 40%, despite falling between 1980 and 2008.^{4,5}

For the last 30 years, Portugal has been among the countries with the highest levels of mean blood pressure (BP).^{6,7} In 2008, the prevalence of hypertension (or use of antihypertensive medication) in adults aged ≥ 25 years was estimated at 41.9% (46.5% in men and 37.4% in women).⁸ Between 1980 and 2008 mean systolic BP fell, particularly in women.⁸

Knowledge of the evolution, trends and current status of epidemiological measures of hypertension (incidence, prevalence and associated mortality) is important for planning, implementation and evaluation of public health measures.⁹

A recent systematic review by Pereira et al. concluded that between 1990 and 2005, the prevalence of hypertension (defined as systolic and/or diastolic BP $\geq 140/90$ mmHg) remained approximately constant in young adults and decreased in middle-aged and older adults, whereas the prevalence of self-reported hypertension increased by 0.4% per year in the same period.¹⁰

Systematic reviews have generally been the preferred method of literature review, but the growing volume and importance of health research has led to the development

of alternative forms of structured review, including scoping reviews, which are increasingly used in public health research.¹¹ Although these may appear simpler than a systematic review, scoping reviews retain a similar organization and transparency. They have been described as a technique to 'map' relevant literature on a particular subject in order to obtain an overall picture of current knowledge,^{11,12} and are mainly used to identify gaps in knowledge and/or to summarize the most important studies in a specific field.¹³ The main difference from systematic reviews is that the latter aim to provide an initial evaluation of the quality of studies and a quantitative and qualitative summary of results, while scoping reviews do not set out to evaluate the quality of studies, but to give a qualitative review of the scope, methods and results of existing research.¹⁴

So far as we know, no studies aimed at describing the scope and results in a particular area of health care research have been published in Portugal using the scoping review methodology. Such a review is of particular importance in relation to hypertension, given the prevalence of the disease and the need to identify any gaps in knowledge in order to define research priorities.

Objectives

The aim of this study is to perform a scoping review on the prevalence and incidence of hypertension in the Portuguese population describing the scope (quantity, focus and nature)^{14,15} of research and to summarize the main results.

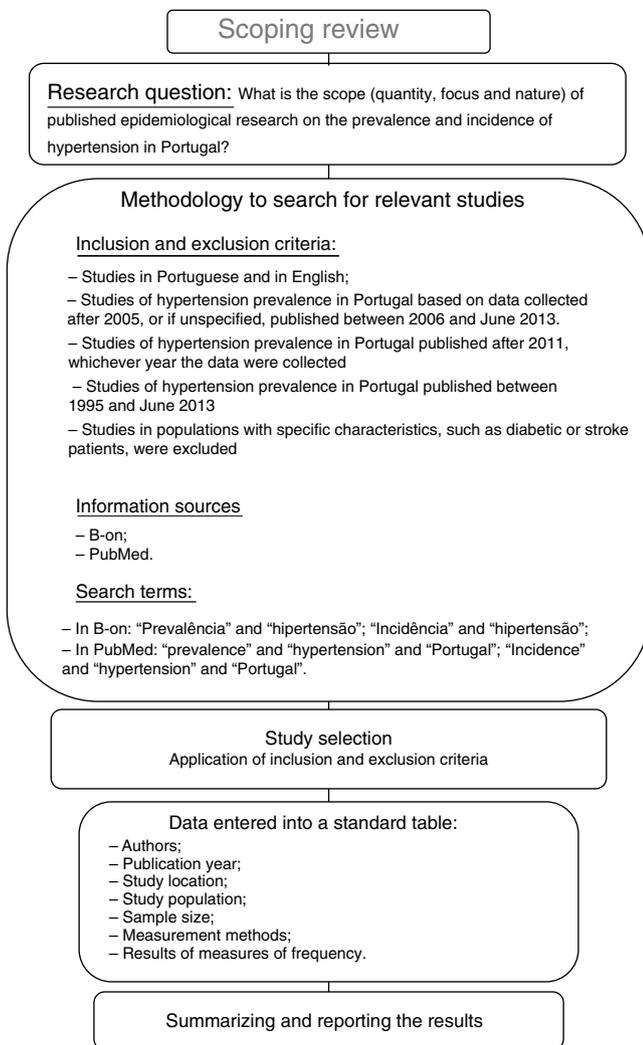


Figure 1 Methodology of the scoping review.

Methods

The review was conducted during June 2013 by two investigators working simultaneously. A panel of three experts (researchers with experience in health care, clinical practice, public health, epidemiology and health research) validated the methodology used (search terms, inclusion and exclusion criteria, information sources, and summary and analysis of the results).¹² The framework of the study was divided into the following stages (Figure 1), in accordance with the methodology proposed by Arksey and O'Malley¹⁴: (1) identifying the research question; (2) identifying relevant studies; (3) selection of studies based on pre-established inclusion criteria; (4) data collection; and (5) summarizing and reporting the results.

Search strategies

We included studies on the prevalence of hypertension based on data collected after 2005, those published after 2005 with an unspecified date of data collection, and those published after 2011 even if data collection was before 2005.

The review thus covered publications not included in the 2012 review by Pereira et al.¹⁰ of trends in hypertension prevalence in Portugal in 1990–2005, in order to update and widen the scope of knowledge, although some studies may appear in both reviews.

Studies on the incidence of hypertension published between January 1995 and June 2013 were included, in order to cover the largest number of publications.

The information sources used were the Portuguese *Biblioteca do Conhecimento Online* (B-on – Online Knowledge Library), run by the *Fundação para a Computação Científica Nacional* (Foundation for National Scientific Computation),¹⁶ and PubMed, maintained by the US National Library of Medicine.¹⁷

We searched for studies in Portuguese and English only (Figure 1), combining the search terms with the Boolean operator AND. In B-on, the Portuguese search terms used were ‘prevalência’ AND ‘hipertensão’, and ‘incidência’ AND ‘hipertensão’. In PubMed the terms used were ‘prevalence’ AND ‘hypertension’ AND ‘Portugal’, and ‘incidence’ AND ‘hypertension’ AND ‘Portugal’.

PubMed is known to be a good source of information for studies on chronic diseases.¹⁸ We also searched B-on using Portuguese search terms only in order to include studies in Portuguese journals, since PubMed does not index all journals published in Portugal.

Studies on hypertension in populations with specific characteristics, such as diabetic or obese individuals, were excluded. No inclusion criteria were established in terms of study design, type of publication, or age of the study population, and, as recommended for scoping reviews,¹⁴ the quality of the study was not used as an inclusion criterion.

Data collection

Data on the following variables were collected and entered into a standard table: author(s), publication year, study location, sample size, BP measurement methods, main results, and stratification by gender and age. The information was entered into the table as the studies were selected and the data were subsequently analyzed in terms of quantity (number of studies), focus (populations, age-groups, diagnosed vs. self-reported hypertension, etc.), and nature (type of research).^{14,15}

Results

Search strategies, study selection and data collection

A total of 527 publications were obtained, 295 studies on prevalence and 232 studies on incidence. Sixteen publications that met the inclusion criteria were selected for analysis, 14 on prevalence (Table 1) and two on incidence (Table 4).

Of the 14 selected publications on prevalence, 11 were found by searching PubMed and three in B-on. One of the two publications on incidence was found in PubMed and one in B-on.

Table 1 Results of searches for studies on prevalence of hypertension, in ascending order of age of participants.

Study	Publication type	Data collection year	Publication year	Study location	Location of data collection
Maldonado et al. ³⁴	Original article	Not specified	2009	Aveleira, Coimbra	Aveleira Clinic
Maldonado et al. ¹⁹	Original article	Not specified	2011	Aveleira, Coimbra	Aveleira Clinic
Oliveira-Martins ³⁵	Undergraduate thesis	2009	2009	Campanhã parish, Porto	11 public primary schools in Campanhã parish
Rocha ²⁴	Master's thesis	Not specified	2010	Lisbon	8 secondary schools in the Lisbon region (five public, three private)
Silva et al. ²⁰	Original article	2006	2012	Lisbon	Camilo Castelo Branco secondary school, Carnaxide, Lisbon
Dores et al. ³⁶	Original article	2006	2010	Lisbon	Not specified
Brandão et al. ³²	Original article	2005–2006	2008	Aveiro	Nursing Laboratory of the School of Health Studies, University of Aveiro
Cortez-Dias et al. ²⁵	Original article	2006 and 2007	2009	Portugal	Health care centers of 719 general practitioners
Loubão et al. ²³	Original article	2007	2010	Barão do Corvo, Vila Nova de Gaia	Health center, Barão do Corvo
Machado et al. ³⁷	Original article	Not specified	2010	Porto	15 parishes of the city of Porto
Oliveira-Martins et al. ³⁸	Original article	2005–2006	2011	Mainland Portugal	60 pharmacies in all five Portuguese health regions (North, Central, Lisbon and Tagus Valley, Alentejo and Algarve)
Perdigão et al. ²¹	Original article	2006–2007	2011	Portugal	North, Central, Lisbon and Tagus Valley, Alentejo, Algarve, Madeira and the Azores
Alves et al. ²⁶	Original article	1999–2003	2012	Porto	Porto
Mendes et al. ²²	Poster	2011	2012	Bragança municipality	Seven old people's homes in Bragança municipality

Table 1 (Continued)

Study	Study design	Study population	Age-groups	Sample size
Maldonado et al. ³⁴	Observational cross-sectional study	Healthy adolescents from the Central region of Portugal followed in sports medicine consultations in Aveleira	5–18 years	1618
Maldonado et al. ¹⁹	Observational cross-sectional study	Healthy adolescents from the Central region of Portugal followed in sports medicine consultations in Aveleira	4–18 years	5381
Oliveira-Martins ³⁵	Observational cross-sectional study	Children born in 2001 attending the 2nd year of the 1st cycle of primary education in 11 public schools in Campanhã parish, Porto	8 years	339
Rocha ²⁴	Observational cross-sectional study	Secondary school students in eight schools in the Lisbon region (five public, three private)	15–18 years	854
Silva et al. ²⁰	Observational cross-sectional study	Adolescents attending Camilo Castelo Branco secondary school, Carnaxide, Lisbon, academic year 2005/2006	16–19 years	234
Dores et al. ³⁶	Observational cross-sectional study	Students at universities in Lisbon, at the Faculty of Medical Sciences of the New University of Lisbon (FCM-UNL), the Higher Institute of Applied Psychology (ISPA) and the School of Engineering of the Technical University of Lisbon (IST)	18–25 years	402
Brandão et al. ³²	Observational cross-sectional study	Students on undergraduate courses at Aveiro University during the 2005/2006 academic year	18–25 years	378
Cortez-Dias et al. ²⁵	Observational cross-sectional study	Representative sample of adults resident in mainland Portugal and the islands of Madeira and the Azores treated at primary health care centers	≥18 years	16 856
Loubão et al. ²³	Observational cross-sectional study	Users of the Barão do Corvo Health Center	≥18 years	502
Machado et al. ³⁷	Observational cross-sectional study	Representative sample of residents of Porto	≥40 years	900
Oliveira-Martins et al. ³⁸	Observational cross-sectional study	Users of 60 pharmacies in all five Portuguese health regions (North, Central, Lisbon and Tagus Valley, Alentejo and Algarve)	≥40 years	1042
Perdigão et al. ²¹	Observational cross-sectional study	Representative sample of individuals of both sexes resident in mainland Portugal or in Madeira or the Azores aged ≥40 years	≥40 years	38 893
Alves et al. ²⁶	Observational cross-sectional study	Representative sample of residents of Porto	≥40 years	2000
Mendes et al. ²²	Observational cross-sectional study	Individuals institutionalized in seven old people's homes in Bragança municipality	≥65 years	91

Table 2 Definitions and measurement methods in the selected studies on hypertension prevalence in children and/or adolescents.

Study	Age-groups	Definition of hypertension	Type of assessment													Results		
			Self-reported		Measured		Type of device			Arm		No. of measurements			Hypertension prevalence			
			Hypertension	Antihypertensive medication	Systolic	Diastolic	Mercury	Aneroid	Digital	Right	Left	1	2	3	Male	Female	Total	
Maldonado et al. ³⁴	5-18 years	SBP and/or DBP \geq P95	X		X	X			X	X	X			X	9.1%	15.0%	9.8%	
Maldonado et al. ¹⁹	4-18 years	SBP and/or DBP \geq P95	X		X	X			X	X	X			X	12.8%	12.8%	12.8%	
Oliveira-Martins ³⁵	8 years	SBP and/or DBP \geq P95	X		X	X			X	NS	NS	X			26.3%	28.0%	27.1%	
Rocha ²⁴	15-18 years	SBP and/or DBP \geq P95	X		X	X			X	X		X			14.7%	6.9%	11.0%	
Silva et al. ²⁰	16-19 years	SBP and/or DBP \geq P95	X		X	X			X	X				X	43.0%	21.0%	34.0%	

DBP: diastolic blood pressure; P95: 95th percentile; SBP: systolic blood pressure. 'X' indicates definition or measurement method specified. 'NS' indicates definition or measurement method not specified.

Table 3 Definitions and measurement methods in the selected studies on hypertension prevalence in adults.

Study	Age-groups	Definition of hypertension	Type of assessment										Results					
			Self-reported		Measured		Type of device			Arm		No. of measurements			Hypertension prevalence			
			Hypertension	Antihypertensive medication	Systolic	Diastolic	Mercury	Aneroid	Digital	Right	Left	1	2	3	Male	Female	Total	
Dores et al. ³⁶	18-25 years	≥140/90 mmHg			X	X			X	X			X			43.9%	10.5%	24.9%
Brandão et al. ³²	18-25 years	≥140/90 mmHg			X	X	X			NS	NS		X	If >5 mmHg difference		13.7%	3.5%	6.9%
Cortez-Dias et al. ²⁵	≥18 years	≥140/90 mmHg		X	X	X	X		X	NS	NS		X		Total: 43.09% 18-29 years: 7.9% 30-39 years: 22.0% 40-49 years: 1.7% 50-59 years: 9.8% 60-69 years: 74.8% 70-79 years: 80.3% ≥80 years: 78.9%	Total: 42.19% 18-29 years: 5.5% 30-39 years: 15% 40-49 years: 39.6% 60-69 years: 72.8% 70-79 years: 82.5% ≥80 years: 82.5%	42.6%	
Loubão et al. ²³	≥18 years	≥140/90 mmHg		X	X	X			X	NS	NS		X		NS	NS	NS	
Machado et al. ³⁷	≥40 years	Diagnosis of hypertension?	X		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NS	NS	Total: 39.7% 40-50 years: 17% 51-60 years: 33% 61-70 years: 57% ≥70 years: 59%	
Oliveira-Martins et al. ³⁸	≥40 years	≥140/90 mmHg		X	X	X			X	NS	NS		X		61.0%	50.6%	54.8%	

Table 3 Continued

Study	Age-groups	Definition of hypertension	Type of assessment											Results					
			Self-reported		Measured		Type of device			Arm		No. of measurements			Hypertension prevalence				
			Hypertension	Antihypertensive medication	Systolic	Diastolic	Mercury	Aneroid	Digital	Right	Left	1	2	3	Male	Female	Total		
Perdigão et al. ²¹	≥40 years	Diagnosis of hypertension?	X		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	21.8%	24.9%	Total: 23.5% 40-49 years: 11.7% 50-59 years: 22.6% 60-69 years: 28.5% 70-79 years: 34.1% ≥80 years: 34.6%
Alves et al. ²⁶	≥40 years	≥140/90 mmHg		X	X	X	X				NS	NS		X	If >5 mmHg difference	Total: NS 40-49 years: 35.9% 50-59 years: 55.8% 60-69 years: 7.2% ≥70 years: 76.7%	Total: NS 0-49 years: 28.7% 50-59 years: 52.2% 60-69 years: 76% ≥70 years: 89.3%	NS	
Mendes et al. ²²	≥65 years	NS			NS	NS					NS	NS	NS	NS	NS		NS	NS	48.4%

'X' indicates definition or measurement method specified. 'NS' indicates definition or measurement method not specified. 'NA' indicates definition or measurement method not applicable.

Table 4 Results of searches for studies on incidence of hypertension.

Study	Publication type	Data collection year	Publication year	Study location	Location of data collection	Study design	Study population	Age-groups	Sample size
Pereira et al. ³⁹	Original article	1999–2003	2012	Porto	Porto	Observational analytical cohort study	Residents of Porto	≥18 years	796
Branco et al. ⁴⁰	Report	2011	2012	Lisbon	North, Central, Lisbon and Tagus Valley, Alentejo and Algarve, Azores, Madeira	Observational analytical cohort study	All patients of members of the general practitioner sentinel network	All	34 981

Research on prevalence of hypertension in Portugal

The selected studies on prevalence are original articles except for three: one undergraduate thesis, one master's thesis and one poster.

Only three studies were national in scope, the others being regional, of which five covered the North region, three the Central region and three the Lisbon and Tagus Valley region.

Data collection took place in the period 1999–2003 in one study, in the period 2005–2006 in two, in 2006 in two, in the period 2006–2007 in two, during 2007 in one, 2009 in one, and 2011 in one. The period of data collection was not specified in four studies.

Three of the studies used samples based on the general population, two were of samples selected from consultations at a medical clinic, two of health center users, one of users of 60 pharmacies, five of students at educational institutions, and one of residents in seven old people's homes.

With regard to the ages of the study populations, five of the selected studies were on children and/or adolescents, and nine were on adults – two in individuals aged 18–25 years, two aged ≥ 18 years, four aged ≥ 40 years and one aged ≥ 65 years.

Of the five studies on children and/or adolescents, the largest was Maldonado et al.¹⁹ (5381 participants) and the smallest was Silva et al.²⁰ (234 adolescents). The largest on adults was Perdigão et al.²¹ (38 893 participants) and the smallest was Mendes et al.²² (91 elderly adults).

The studies on children and/or adolescents used similar definitions of hypertension and BP measurement methods (Table 2), all defining hypertension as systolic and/or diastolic BP at or above the 95th percentile and using digital devices to measure BP. In three of the studies the mean of three measurements was used, while a single measurement was used in two. In two studies BP was measured in both arms and the mean of values in the arm giving the highest reading was used in the analysis; the right arm was used in two studies; and this information was missing in one study.

Of the nine studies in adults, hypertension was self-reported in two, while in the other seven BP was measured and hypertension was defined as systolic and/or diastolic BP $\geq 140/90$ mmHg (Table 3). In four of the latter studies, patients were only considered to have hypertension with BP $\geq 140/90$ mmHg accompanied by antihypertensive medication. Three of these studies used digital BP monitors, two used mercury sphygmomanometers, one used an aneroid device and one used digital or mercury devices. In six studies it was not specified which arm was used for the measurements, only one study specifying the right arm. Four of these studies used the mean of two measurements, two the mean of two measurements or three if the difference between the first two was more than 5 mmHg, and in one study this information was missing.

Estimates of the prevalence of hypertension in children and/or adolescents ranged between 9.8% and 34%, in adults aged 18–25 years it varied between 6.9% and 24.9%, in adults aged ≥ 18 years it was 42.62%, in individuals aged ≥ 40 years it ranged between 23.5% and 54.80%, and in the only study on individuals aged ≥ 65 years it was 48.4%. There was no

overall estimate of hypertension prevalence in Loubão et al.²³ because the study population was divided into smokers and non-smokers.

Only four of the studies on prevalence stratified the results into age-groups, 11 presented results stratified by gender, and only two were stratified by both age and gender. In the four studies stratified by age, prevalence increased with age.

In studies solely on adolescents stratified by gender,^{20,24} prevalence was higher in males, while in the three studies in children and/or adolescents (aged 4–18 years, 5–18 years and 8 years), prevalence was higher in females in two studies and the same in one (Table 2).

In all studies on adults in which BP was measured, hypertension prevalence was higher in males, whereas it was lower in males in studies in which hypertension was self-reported.

Research on incidence of hypertension in Portugal

Of the two selected studies on the incidence of hypertension in the Portuguese population, one is an original article on adults aged ≥ 18 years and the other a report from the Portuguese general practitioner sentinel network on all age-groups (Table 4).

Only one of these studies, the original article, reports the method used to assess BP (digital device and mean of two measurements or three if the difference between the first two was more than 5 mmHg) (Table 5) and defines hypertension as BP $\geq 140/90$ mmHg and/or use of antihypertensive medication.

This study, of 796 individuals in the Porto region, found an incidence of hypertension of 57.3/1000 population/year, while in the report of 34 981 individuals from all regions of Portugal the incidence was 6.54/1000 population/year. The incidence was lower in females in both studies.

In the Porto study incidence rose with age in both sexes, while in the national study this was true up to the age of 54, after which it fell.

Discussion

The population that has been the subject of the largest number of studies on hypertension prevalence was that of the North region, particularly the city of Porto. No study has dealt exclusively with the Alentejo and Algarve regions, a gap in knowledge that should be filled by new studies or publication of existing data. However, the national studies by Cortez-Dias et al.²⁵ and Perdigão et al.²¹ include estimates of measured and self-reported hypertension, respectively, for these regions: 51.54% and 44.57% (measured) and 23% and 18.3% (self-reported) for the Alentejo and the Algarve, respectively.

We found long delays between data collection and publication of results (up to nine years).²⁶ This implies that studies on recent data may not yet have been published. For instance, the Portuguese Hypertension and Salt Study (PHYSA), conducted by the Portuguese Society of Hypertension, collected data on a representative sample of 3720

Table 5 Results of searches for studies on incidence of hypertension.

Study	Definition of hypertension	Type of assessment											Results				
		Self-reported		Measured		Type of device			Arm		No. of measurements			Hypertension incidence			
		Hypertension	Antihypertensive medication	Systolic	Diastolic	Mercury	Aneroid	Digital	Right	Left	1	2	3	Male	Female	Total	
Pereira et al. ³⁹	≥140/90 mmHg		X	X	X	X				X			X	If >5 mmHg difference	52.7 per 1000 person/years <40 years: 40 40-60 years: 62 <60 years: 64.4	43.4 per 1000 person/years <40 years: 23.1 40-60 years: 53.1 <60 years: 110	57.3 per 1000 person/years
Branco et al. ⁴⁰	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	730.8 per 105 person/years 25-34 years: 236.8 35-44 years: 936.7 45-54 years: 1521.7 55-64 years: 1432.4 65-74 years: 1199.2 ≥75 years: 704.2	585.1 per 105 person/years 25-34 years: 269.6 35-44 years: 621.6 45-54 years: 1243.8 55-64 years: 1148.9 65-74 years: 817.6 ≥75 years: 521.8	654 per 10 ⁵ person/years

'X' indicates definition or measurement method specified. 'NS' indicates definition or measurement method not specified.

residents of mainland Portugal in 2012 but had not published its results when this review was completed.²⁷

The studies on hypertension prevalence in children and/or adolescents used similar definitions of hypertension and BP measurement methods (at or above the 95th percentile and digital devices), in accordance with the US guidelines on high blood pressure in children and adolescents, which are used internationally.²⁸ This facilitates comparisons between the results of different studies and monitoring of developments in hypertension prevalence in these population groups. However, there were methodological differences between the studies: three made three BP measurements and two made only one, while two studies took measurements in both arms, two in the right arm, and one did not specify. According to the US guidelines BP should be measured in the right arm.²⁸

Of the nine studies on hypertension prevalence in adults, hypertension was self-reported in only two and BP was measured in the others. Hypertension was defined as BP \geq 140/90 mmHg. Only five studies reported the type of measurement device used (which varied widely), and only one study specified which arm was used. These findings indicate inadequate description of methods, which hinders comparisons between studies. According to a recent review by Crim et al.,²⁹ surveillance definitions of hypertension vary in the literature, and clear definitions of measurement methods are crucial for monitoring its prevalence and incidence. Crim et al. propose standard definitions to be used in research in this area.

According to the guideline of the Portuguese Directorate-General of Health (DGS) entitled “*Hipertensão arterial: Definição e classificação*” (“Hypertension: definition and classification”), a diagnosis of hypertension should be based on at least two measurements, in the arm that gives the higher BP reading.^{30,31} This was not followed in any of the studies in this scoping review; the studies by Cortez-Dias et al.²⁵ and Brandão et al.³² describe the measurement method used except for the arm used, and state that they followed the American Heart Association guidelines,³³ which are similar to the recommendations of the DGS.

Only two of the studies on hypertension prevalence present results stratified by both age and gender, which is a significant obstacle to an understanding of the epidemiology of the disease.²⁹

In all the studies on adults with results stratified by gender in which BP was measured, hypertension prevalence was lower in women, in agreement with the systematic review by Pereira et al.¹⁰ and the World Health Organization figures for Portugal in 2008.⁴

In the only study which presented self-reported hypertension prevalence and results stratified by gender, the prevalence was lower in men, as also reported by Pereira et al.¹⁰

The fact that the studies on adults selected for this review use different BP measurement methods, not specified in many cases, and are infrequently stratified by age and gender, seriously hinders comparisons and analysis. This will of course have an effect on knowledge of the epidemiology of hypertension in Portugal and hence on implementation of health care policies and measures.

The results of our study reveal the need for greater uniformity in measurement and reporting methods for research

into hypertension, in order to improve the comparability, data collection and analysis of studies on the evolution and trends in hypertension in the Portuguese population. They also point up the need to perform a quantitative analysis of the variability of data resulting from the application of different BP measurement methods.

Regarding hypertension incidence, the two selected studies were of very different populations: residents of the city of Porto, and the general Portuguese population. In the Porto study (1999–2003), incidence was 57.3/1000 population/year, while in the 2011 national report from the general practitioner sentinel network it was 6.54/1000 population/year. This discrepancy may reflect a fall in incidence between 2003 and 2011, or it may be due simply to differences in sample size, target populations and measurement methods.

The existence of only two studies since 1995 on hypertension incidence in Portugal reveals a gap in knowledge in this area that should prompt future research.

Conclusions

The present scoping review of research into the prevalence and incidence of hypertension in the Portuguese population allows the following conclusions to be drawn: (i) in the last eight years, more studies have been published on populations in the North region; (ii) although the Alentejo and Algarve regions were included in two national studies, their populations have not been specifically targeted in any published studies; (iii) there have been long delays between data collection and publication of results on hypertension prevalence (up to nine years), which hinders comparison of these studies with others in which data collection was nearer to publication date; (iv) only two studies on hypertension incidence were published between 1995 and 2013, which reveals a gap in knowledge that needs to be filled; and (v) differences in blood pressure measurement methods, not specified in most studies, and the infrequency of stratification of results by gender and age, hinder comparison and analysis, and hence monitoring of trends in the incidence and prevalence of hypertension in Portugal.

Conflicts of interest

The authors have no conflicts of interest to declare.

References

1. World Health Organization. Causes of death 2008: data sources and methods. Geneva: World Health Organization; 2008. Available from: http://www.who.int/healthinfo/global_burden_disease/cod_sources_methods.pdf [accessed on 24.10.13].
2. Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380:2224–60.

3. World Health Organization. Risk factors: blood pressure. Global Health Observatory Data Repository. Geneva: World Health Organization; 2008. Available from: <http://apps.who.int/gho/data/node.main.A874?lang=en> [accessed 24.10.13].
4. World Health Organization. Global status report on noncommunicable diseases 2010. Geneva: World Health Organization; 2011. Available from: http://whqlibdoc.who.int/publications/2011/9789240686458_eng.pdf [accessed 24.10.13].
5. Danaei G, Finucane MM, Lin JK, et al. National, regional, and global trends in systolic blood pressure since 1980: systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5.4 million participants. *Lancet*. 2011;377:568–77.
6. Instituto Nacional de Estatística. The demographic changes in Portugal. Lisboa: Instituto Nacional de Estatística; 2008.
7. Macedo M, Lima MJ, Silva AO, et al. Prevalence, awareness, treatment and control of hypertension in Portugal. The PAP study. *Rev Port Cardiol*. 2007;26:21–39.
8. European Society of Cardiology. European Cardiovascular Disease Statistics 2012. Brussels: European Heart Network AISBL; 2012. Available from: <http://www.bhf.org.uk/plugins/PublicationsSearchResults/DownloadFile.aspx?docid=352b602f-e110-4fca-89ec-a24229e7a1c0&version=-1&title=European+Cardiovascular+Statistics+2012&resource=HS2012EC> [accessed 24.10.13].
9. Wallace RB, Kohatsu N, Brownson R, et al. Public health & preventive medicine. 15th ed. East Norwalk, CT: Appleton & Lange; 1998.
10. Pereira M, Carreira H, Vales C, et al. Trends in hypertension prevalence (1990–2005) and mean blood pressure (1975–2005) in Portugal: a systematic review. *Blood Press*. 2012;21:220–6.
11. Centre for Reviews and Dissemination. Systematic reviews: CRD's guidance for undertaking reviews in health care. York: Centre for Reviews and Dissemination; 2008.
12. Armstrong R, Hall BJ, Doyle J, et al. Cochrane Update. 'Scoping the scope' of a Cochrane review. *J Public Health*. 2011;33:147–50.
13. Brien SE, Lorenzetti DL, Lewis S. Overview of a formal scoping review on health system report cards. *Implement Sci*. 2010;2–5.
14. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8:19–32.
15. Weeks LC, Strudsholm T. A scoping review of research on complementary and alternative medicine (CAM) and the mass media: looking back, moving forward. *BMC Complement Altern Med*. 2008;8:1–9.
16. Biblioteca do Conhecimento Online Manual B-on. Lisboa: Ministério da Ciência, Tecnologia e Ensino Superior; 2013. Available from: http://www.b-on.pt/downloads/Projectos_Servicos/Manual%20b-on.pdf [accessed 24.10.13].
17. PubMed user's guide. California: UCSD Biomedical and Medical Center Libraries; 2006. Available from: <http://biomed.ucsd.edu/pubmed/pmguide.pdf> [accessed 24.10.13, updated 2006].
18. Haafkens J, Moerman C, Schuring M, et al. Searching bibliographic databases for literature on chronic disease and work participation. *Occup Med (Lond)*. 2006;56:39–45.
19. Maldonado J, Pereira T, Fernandes R, et al. An approach of hypertension prevalence in a sample of 5381 Portuguese children and adolescents. The AVELEIRA registry. *Blood Press*. 2011;20:153–7.
20. Silva D, Matos A, Magalhães T, et al. Prevalência de hipertensão arterial em adolescentes portugueses da cidade de Lisboa. *Rev Port Cardiol*. 2012;31:789–94.
21. Perdígão C, Rocha E, Duarte JS, et al. Prevalência, caracterização e distribuição dos principais factores de risco cardiovascular em Portugal. Uma análise do Estudo AMÁLIA. *Rev Port Cardiol*. 2011;30:393–432.
22. Mendes E, Preto L, Novo A, et al. Obesidade e hipertensão arterial numa amostra de idosos institucionalizados do Concelho de Bragança. *Poster* apresentado nas II Jornadas de Farmácia Essa-IPB; 2012. Available from: <https://bibliotecadigital.ipb.pt/bitstream/10198/1/1/OBESIDADE%20E%20HTA%20IDO%20SOS.pdf> [accessed 24.10.13].
23. Loubão A, Marques P, Leite C, et al. Tabagismo e factores de risco cardiovascular no centro de saúde de Barão do Corvo. *Acta Med Port*. 2010;23:159–66.
24. Rocha T. Perfil de risco cardiovascular em amostras de estudantes do ensino secundário da região de Lisboa. Lisboa: Faculdade de Medicina de Lisboa; 2010. Available from: http://repositorio.ul.pt/bitstream/10451/1918/1/91_Tese_Final.pdf [accessed 24.10.13].
25. Cortez-Dias N, Martins S, Bela A, et al. Prevalência e padrões de tratamento da hipertensão arterial nos cuidados de saúde primários em Portugal Resultados do estudo VALSIM. *Rev Port Cardiol*. 2009;28:499–523.
26. Alves L, Silva A, Barros H. Socioeconomic inequalities in the prevalence of nine established cardiovascular risk factors in a southern European population. *PLoS ONE*. 2012;75:1–9.
27. Sociedade Portuguesa de hipertensão. Portuguese Hypertension and SALT study; 2012. Available from: http://www.sphta.org.pt/pdf/PHYSA_study_Slides_SPH-v2.pdf [accessed 24.10.13].
28. The Fourth Report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Bethesda: U.S. Department of Health and Human Services, National Institutes of Health; 2005. Available from: http://www.nhlbi.nih.gov/health/prof/heart/hbp/hbp_ped.pdf [accessed 24.10.13, updated 2005].
29. Crim MT, Yoon SS, Ortiz E, et al. National surveillance definitions for hypertension prevalence and control among adults. *Circ Cardiovasc Qual Outcomes*. 2012;5:343–51.
30. Polónia J, Ramalhinho V, Martins L, et al. Avaliação e tratamento da hipertensão arterial da Sociedade Portuguesa de Hipertensão. *Rev Port Cardiol*. 2006;25:649–60.
31. Direção Geral de Saúde. Norma 020/2011 Hipertensão arterial: definição e classificação. Lisboa: Direção Geral de Saúde; 2013. Available from: http://www.seram.pt/wp-site/wp-content/files_mf/1363907459Hipertens%C3%A3oArterialdefini%C3%A7%C3%A3oecl%C3%A7%C3%A3o.pdf [accessed 24.10.13, updated 19.03.13].
32. Brandão M, Pimentel FL, Silva CC, et al. Fatores de risco cardiovascular numa população Universitária Portuguesa. *Rev Port Cardiol*. 2008;27:7–25.
33. AHA Scientific Statement. Blood Pressure Measurement in Humans. American Heart Association. Blood pressure testing and measurement – AHA Recommendation; 2005. Available from: <http://hyper.ahajournals.org/content/45/1/142.full> [accessed 24.10.13].
34. Maldonado J, Pereira T, Fernandes R, et al. Distribuição da pressão arterial em crianças e adolescentes saudáveis: dados do Registo da Aveleira. *Rev Port Cardiol*. 2009;28:1233–44.
35. Oliveira-Martins S. Obesidade e hipertensão Infantil juntas na Pandemia. Porto: Faculdade de Ciências da Nutrição e Alimentação da Universidade do Porto; 2009. Available from: <http://repositorioaberto.up.pt/bitstream/10216/54692/2/130835.0952TCD52.pdf> [accessed 24.10.13].
36. Dores H, Santos P, Salvador F, et al. Tensão arterial em jovens adultos. *Rev Port Cardiol*. 2010;29:1495–508.
37. Machado H, Alves AS, Tinoco C, et al. Prevalência do diagnóstico de hipertensão arterial em Pessoas Sedentárias e em Praticantes de Exercício Físico, na Cidade do Porto. *Acta Med Port*. 2010;23:153–8.

38. Oliveira-Martins S, Oliveira T, Gomes J, et al. Factores associados à hipertensão arterial nos utentes de farmácias em Portugal. *Rev Saude Publica*. 2011;45:136–44.
39. Pereira M, Lunet N, Paulo C, et al. Incidence of hypertension in a prospective cohort study of adults from Porto, Portugal. *BMC Cardio Disord*. 2012;12:1–8.
40. Branco MJ, Silva S, Baptista I, et al. Médicos-Sentinela: relatório de atividades 2011. Lisboa: Insa; 2012. Available from: <http://www.rcaap.pt/detail.jsp?id=oai:repositorio.insa.pt:10400.18/1150> [accessed 24.10.13].