Hypertenze a reprodukce

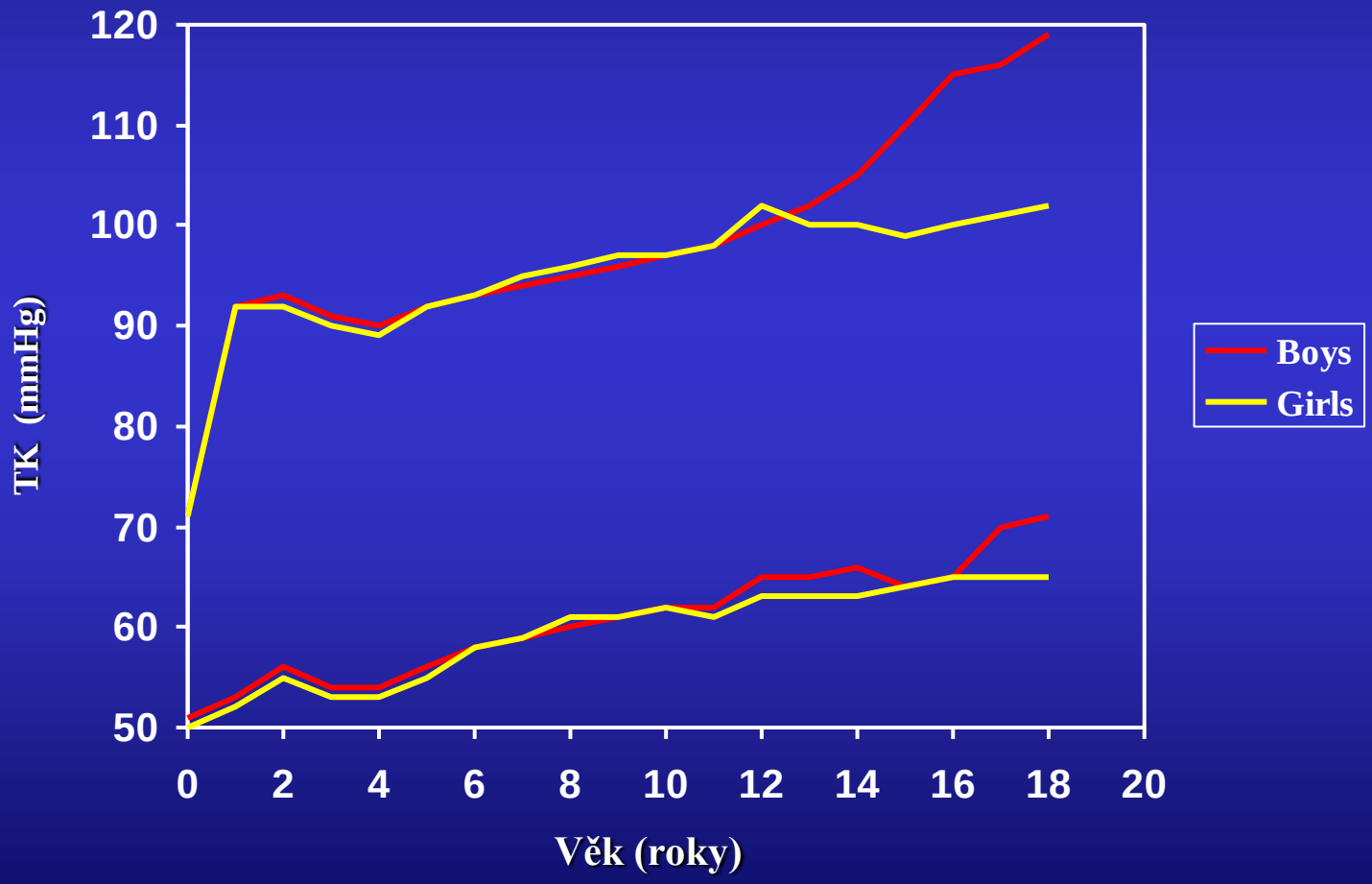
Renata Cífková

Centrum kardiovaskulární prevence 1. LF UK a TN
II. interní klinika 1. LF UK a VFN
Praha

- Epidemiologie hypertenze v reprodukčním věku
- Prenatální poradenství v léčbě hypertenze
- Perorální antikoncepce
- Asistovaná reprodukce

- Epidemiologie hypertenze v reprodukčním věku
- Prenatální poradenství v léčbě hypertenze
- ~~Hypertenze v těhotenství~~
- Perorální antikoncepce
- Asistovaná reprodukce

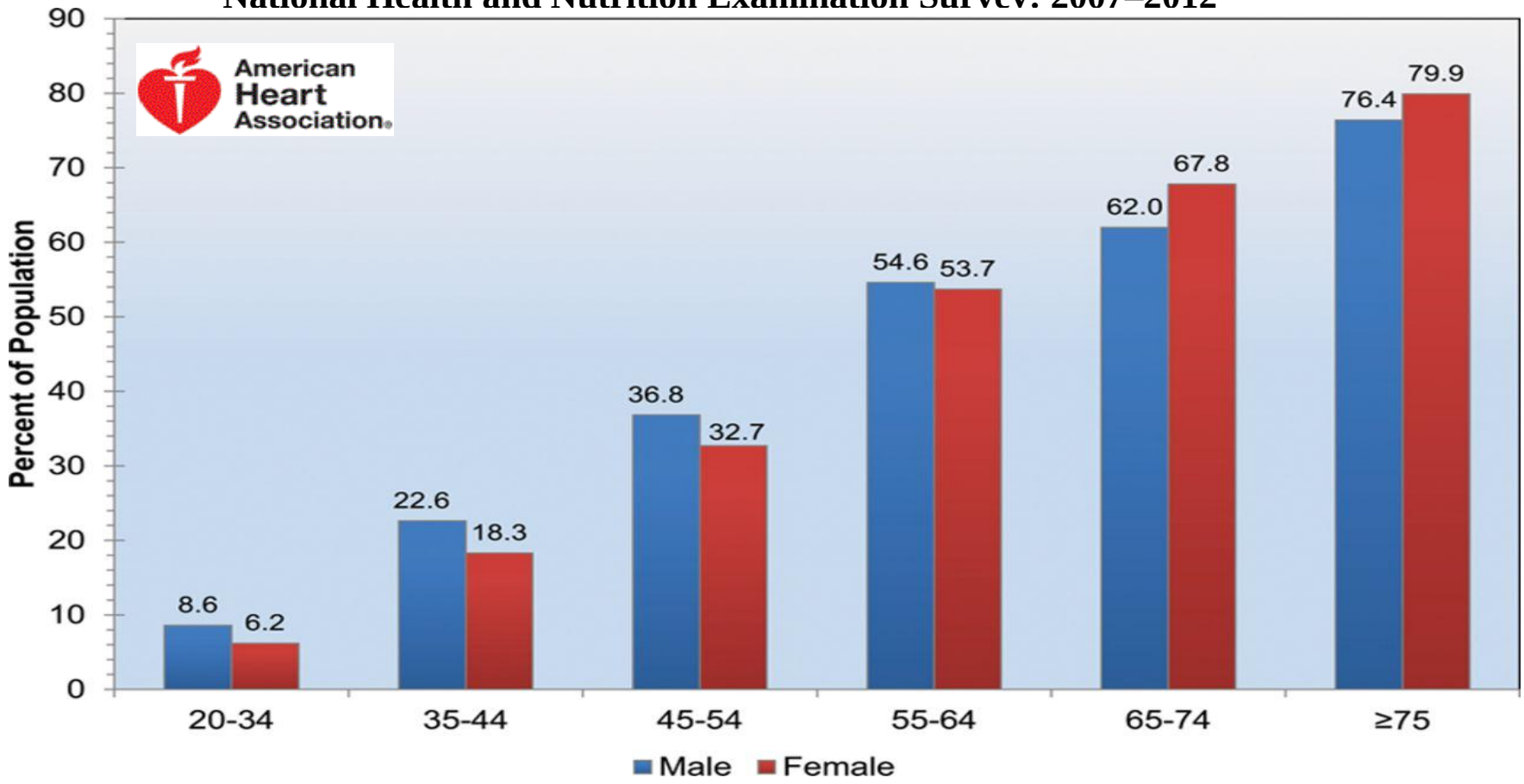
Průměrný STK a DTK u chlapců a dívek od narození to 18 let, USA



Pediatrics 1987;79:1-25

Prevalence of high BP in adults ≥20 years of age by age and sex

National Health and Nutrition Examination Survey: 2007–2012

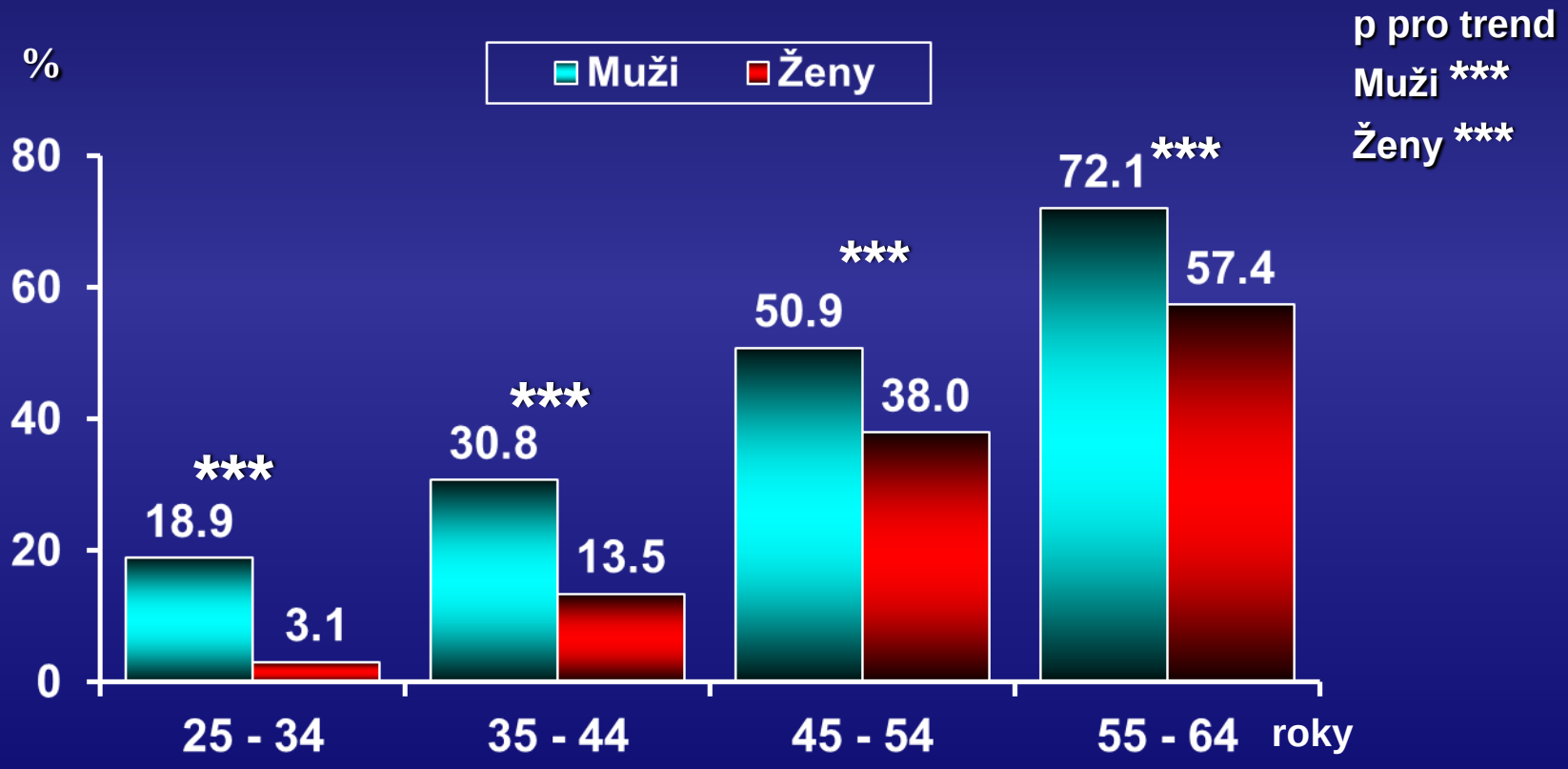


Population Group	Prevalence, 2012, Age ≥20 y	Mortality,* 2013, All Ages	Hospital Discharges, 2010, All Ages
Both sexes	80 000 000 (32.6%)	71 942	488 000
Males	38 300 000 (33.5%)	33 563 (46.7%)†	216 000
Females	41 700 000 (31.7%)	38 379 (53.3%)†	272 000

Circulation. 2016;133:e38-e360

Prevalence hypertenze podle věkových skupin

Česká republika, 2015-2018



Cífková et al., nepublikovaná data

OPEN ACCESS Freely available online PLoS one

Hypertension in Women of Reproductive Age in the United States: NHANES 1999-2008

Brian T. Bateman[1]*, Kate M. Shaw[2], Elena V. Kuklina[2], William M. Callaghan[3], Ellen W. Seely[4], Sonia Hernández-Díaz[5]

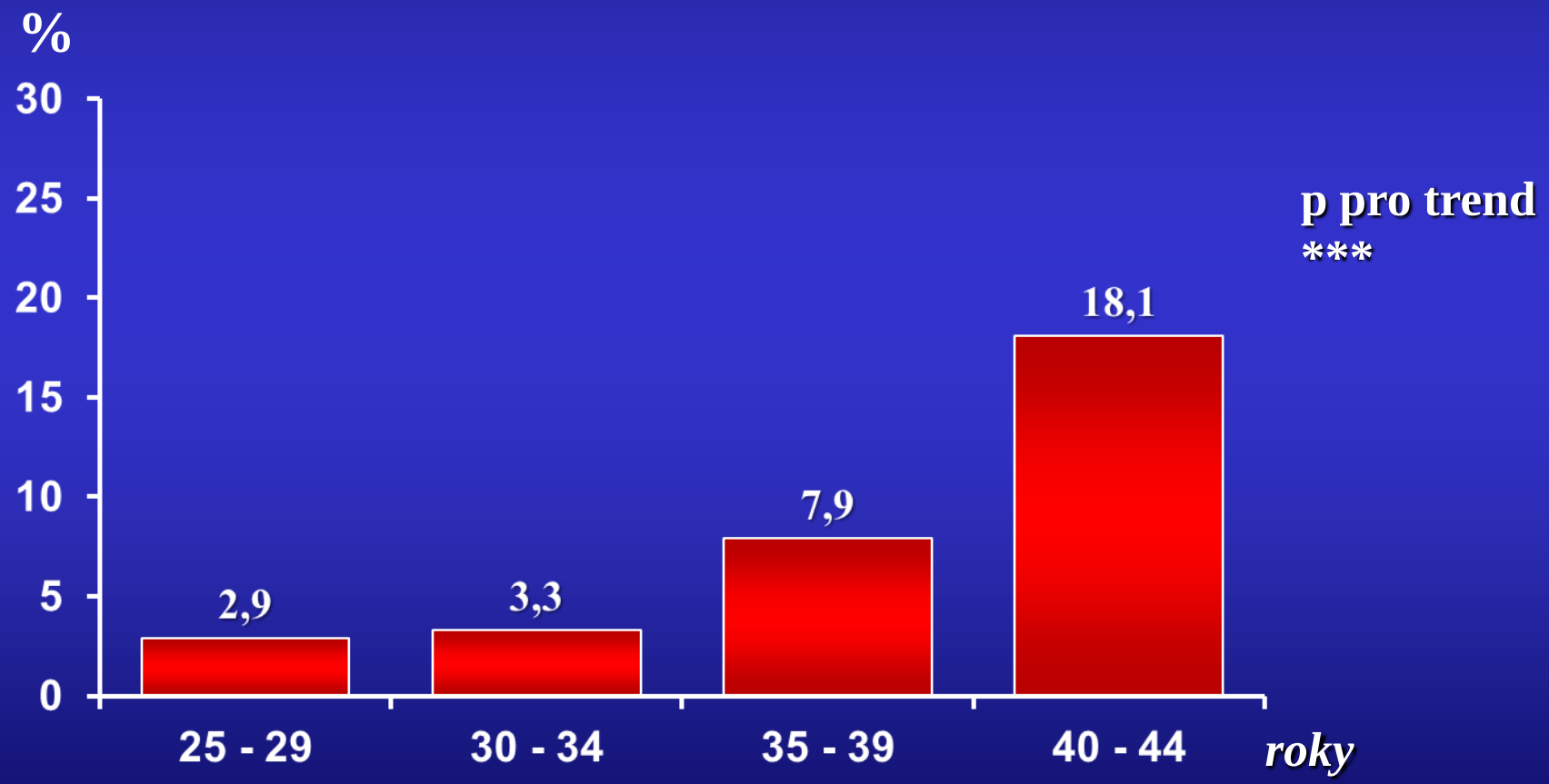
1 Division of Obstetric Anesthesia, Department of Anesthesia, Critical Care, and Pain Medicine, Massachusetts General Hospital, Harvard Medical School, Boston, Massachusetts, United States of America, 2 Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America, 3 Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, Georgia, United States of America, 4 Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts, United States of America, 5 Department of Epidemiology, Harvard School of Public Health, Boston, Massachusetts, United States of America

- **Studie:** NHANES 1999 – 2008
- **Populace:** 5521 žen ve věku 20–44 let
- **Závěr:** Hypertenze se vyskytuje u přibližně 8 % žen v reprodukčním věku

PLoS ONE 7(4): e36171 doi:10.1371/journal.pone.0036171

Prevalence hypertenze u žen v reprodukčním věku

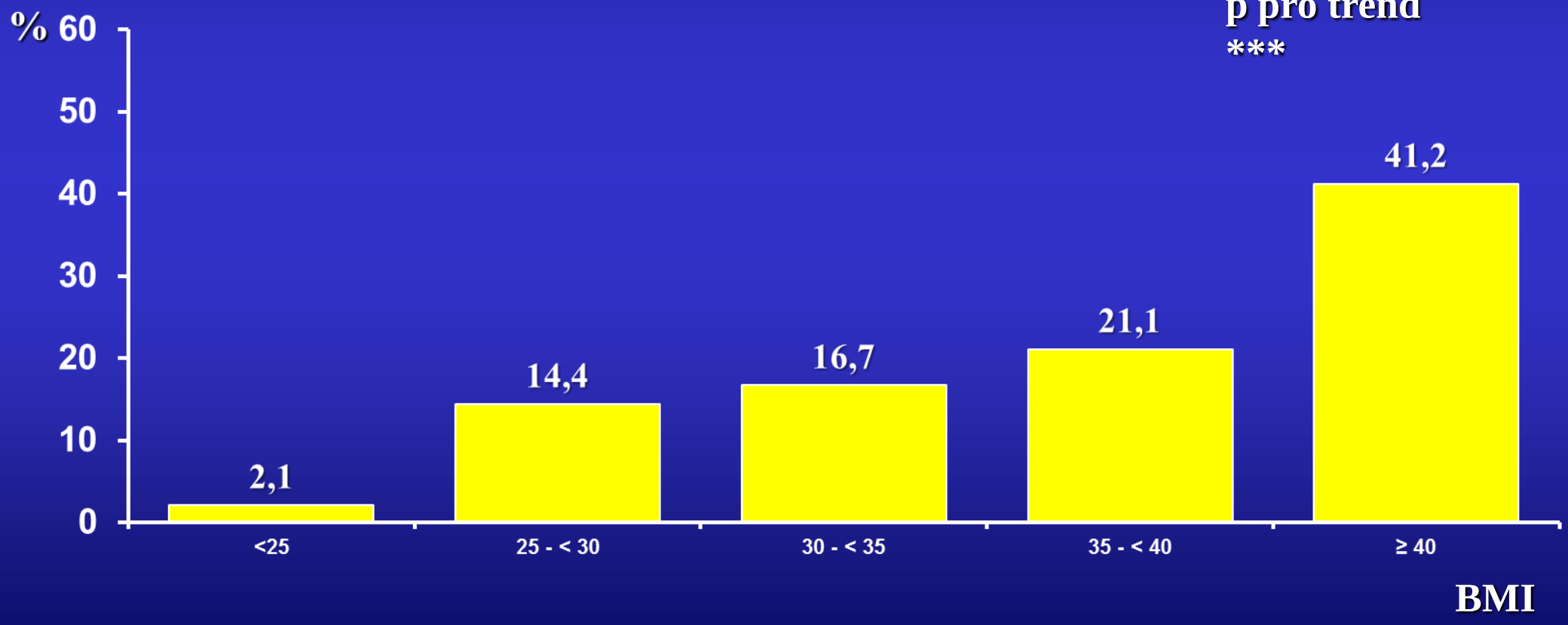
Česká republika, 2015 – 2018



Cífková et al., nepublikovaná data

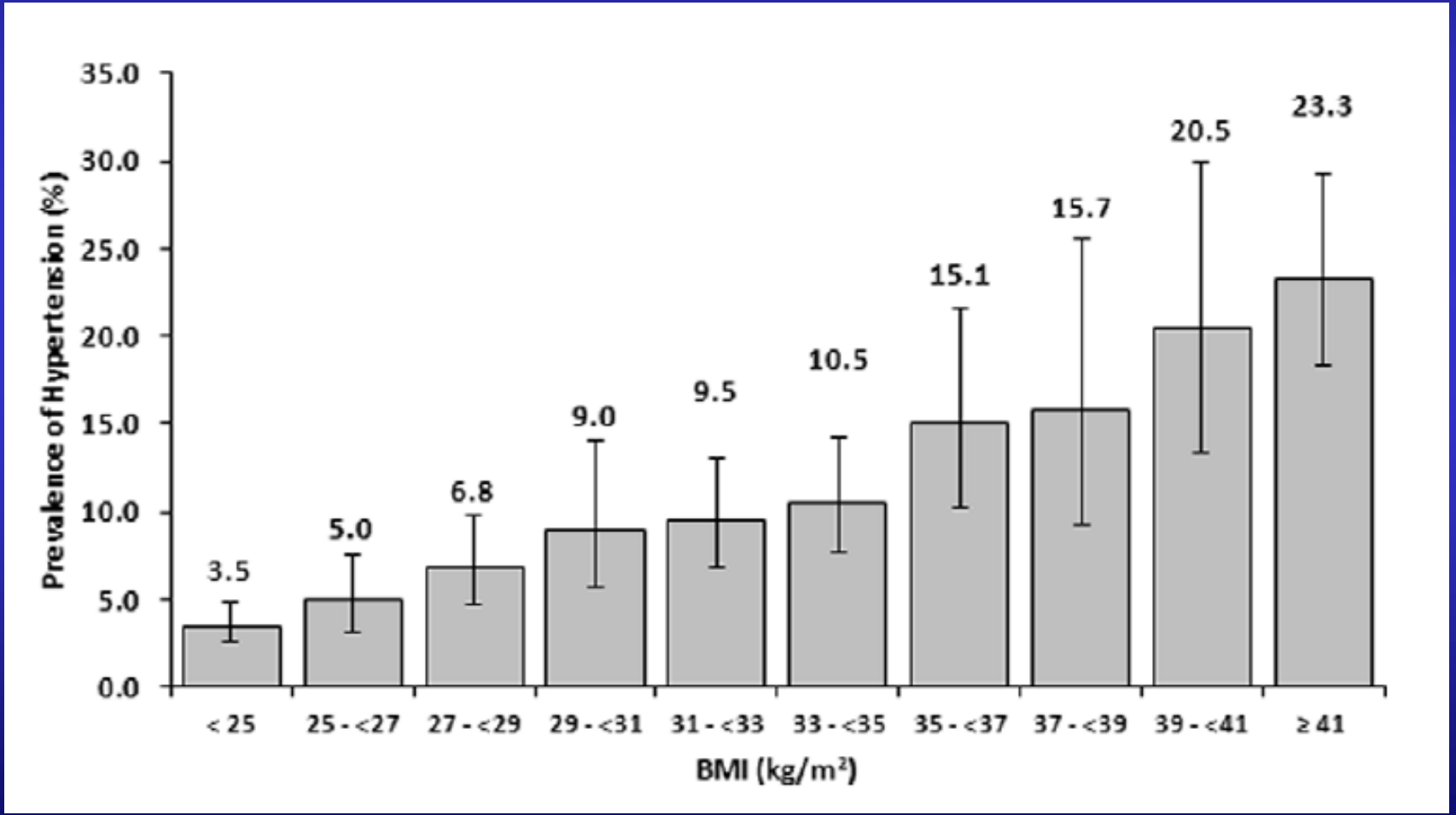
Prevalence hypertenze u žen v reprodukčním věku podle BMI

Česká republika, 2015 – 2018



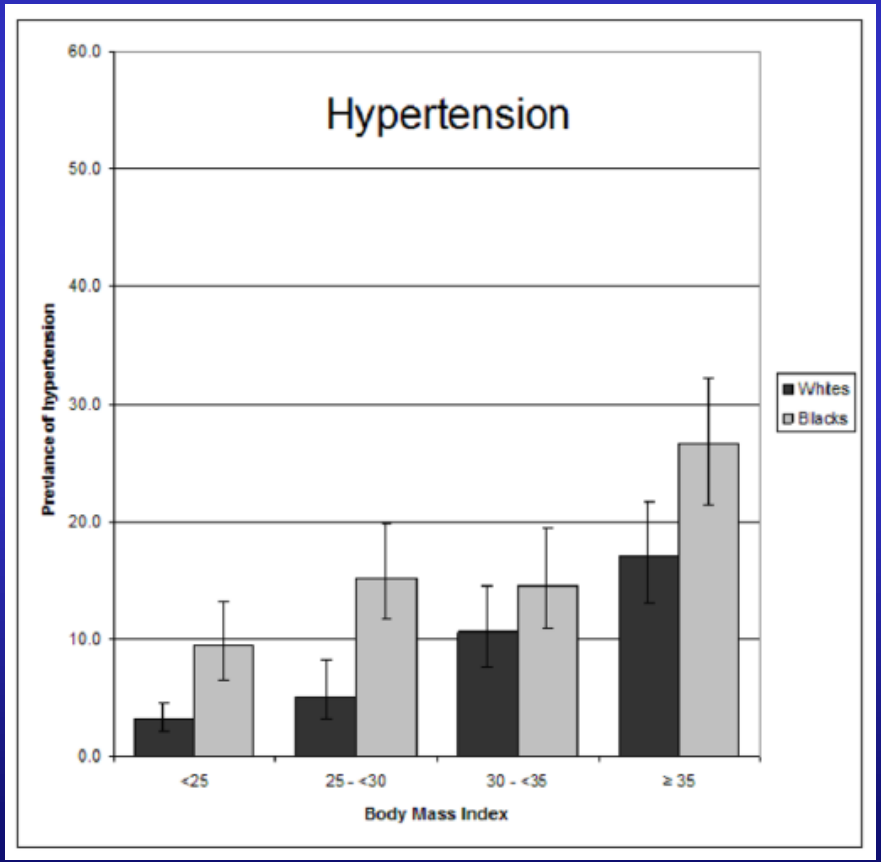
Cífková et al., nepublikovaná data

Prevalence hypertenze podle BMI u žen reprodukčního věku (20–44 let) USA, NHANES, 1999–2008



PLoS ONE 7(4): e36171 doi:10.1371/journal.pone.0036171

Prevalence hypertenze bělošských a černošských žen reprodukčního věku (20–44 let) USA, NHANES, 1999–2008



PLoS ONE 7(4): e36171 doi:10.1371/journal.pone.0036171

Prenatální poradenství

- **Inhibitory ACE, AT_1-blokátory a přímé inhibitory reninu nemají být předepisovány ženám v reprodukčním věku bez spolehlivé antikoncepce**

Prenatální poradenství

- Inhibitory ACE, AT_1-blokátory a přímé inhibitory reninu nemají být předepisovány ženám v reprodukčním věku bez spolehlivé antikoncepce
- Inhibitory ACE, AT_1-blokátory a přímé inhibitory reninu jsou přísně kontraindikovány v těhotenství

Compelling and possible contraindications to the use of specific antihypertensive drugs

Drug	Contraindications	
	Compelling	Possible
Diuretics (thiazides/thiazide-type, e.g. chlorthalidone and indapamide	• Gout	• Metabolic syndrome • Glucose intolerance • Pregnancy • Hypercalcemia • Hypokalemia
Beta-blockers	• Asthma • Any high-grade sino-atrial or atrioventricular block • Bradycardia (heart rate < 60 beats per min)	• Metabolic syndrome • Glucose intolerance • Athletes and physically active patients
Calcium antagonists (dihydropyridines)		• Tachyarrhythmia • Heart failure (HFrEF, class III or IV) • Pre-existing severe leg oedema
Calcium antagonists (verapamil, diltiazem)	• Any high-grade sino-atrial or AV block • Severe LV dysfunction (LV EF < 40%) • Bradycardia (heart rate < 60 beats per min)	• Constipation
ACE inhibitors	• Pregnancy • Previous angioneurotic oedema • Hyperkalemia (potassium > 5.5 mmol/L) • Bilateral renal artery stenosis	• Women of child-bearing potential without reliable contraception
ARBs	• Pregnancy • Hyperkalemia (potassium > 5.5 mmol/L) • Bilateral renal artery stenosis	• Women of child-bearing potential without reliable contraception

Prenatální poradenství

- Betablokátory mohou navodit bradykardii, růstovou retardaci a hypoglykémii u plodu; TK snižují méně než blokátory kalciových kanálů

Atenolol in essential hypertension during pregnancy

Lucy Butters, Susan Kennedy, Peter C Rubin

Abstract

Objective—To determine the effect of atenolol on the outcome of pregnancy in women with essential hypertension.

Design—Prospective, randomised, double blind, placebo controlled study.

Setting—Hospital clinic.

Patients—33 Women with mild essential hypertension (systolic blood pressure 140-170 mm Hg or diastolic pressure 90-110 mm Hg on two occasions at least 24 hours apart) consecutively referred to two obstetric medical clinics. Four patients in the placebo group were withdrawn from the study: control of blood pressure was inadequate in two, one developed breathlessness, and one changed her mind about participating. The mean gestation in the 29 remaining women on entry to the study was 15·9 weeks.

Main outcome measures—Blood pressure and birth weight.

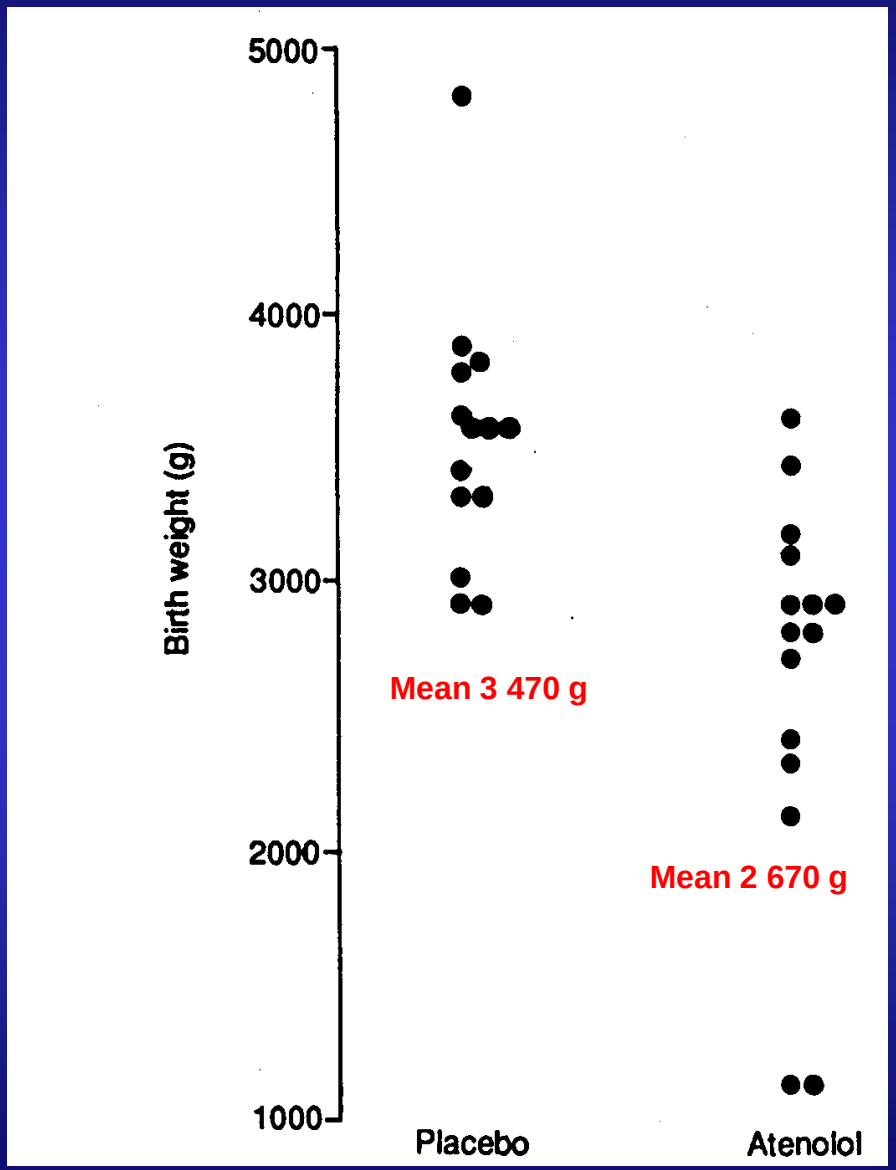
Intervention—14 Women received placebo. 15 Women received atenolol 50 mg daily initially, increasing until either the blood pressure was <140/90 mm Hg or a dose of 200 μg daily was reached.

Results—The mean blood pressure on entry was 148/86 mm Hg in the group given atenolol and 144/86 mm Hg in the group given placebo. During treatment the mean diastolic pressure was significantly reduced by atenolol compared with placebo (to 74 *v* 81 mm Hg; difference in means (95% confidence interval) 7·0 (2·9 to 10·0) mm Hg) but the effect on systolic pressure was marginal (132 *v* 136 mm Hg; 4·0 (−1·4 to 8·6) mm Hg). Babies in the atenolol group had a significantly lower birth weight than those in the placebo group (2620 g *v* 3530 g; 910 (440 to 1380) g).

Conclusion—Atenolol given from the end of the first trimester in patients with mild hypertension is associated with intrauterine growth retardation. When taken in conjunction with the results of a previous study in which methyldopa was given these findings indicate that benefit is unlikely to result from treating mild essential hypertension in pregnancy.

BMJ 1990;301:587-9

Birth weights of babies in atenolol and placebo groups



BMJ 1990;301:587-9

Effect of *Atenolol* on Birth Weight

Gregory Y.H. Lip, MD, Michèle Beevers, SRN, David Churchill, MD, Lara M. Shaffer, MB, and D. Gareth Beevers, MD

A previous small, prospective study from Glasgow reported that babies born to women treated with atenolol in early pregnancy had significantly lower birth weights than those in the placebo group.[1] Beta blockers, while safe in the third trimester of pregnancy, are also considered to cause significant growth restriction when used for longer periods.[2] An antenatal hypertension clinic has been in operation at City Hospital, Birmingham since 1980, where pregnant women with hypertension undergo careful follow-up jointly by an obstetrician and a physician with a special interest in hypertension. Patients were referred to the clinic by obstetricians and general practitioners on the basis of previous hypertension, or raised blood pressures detected for the first time in pregnancy. In many, the blood pressure decreased with no therapy, and where possible antihypertensive drugs were discontinued. After the Glasgow study,[1] the use of atenolol in early pregnancy was discontinued and an audit was conducted of birth weights in relation to drug therapy.

• • •

We conducted an analysis of our own prospectively gathered and computerized database of all women attending our clinic between 1980 and 1995. Information on demographic data, presenting blood pressures, drug therapies, pregnancy complications, and pregnancy outcome were recorded. The mean termine significant predictors for birth weights. A p value <0.05 was considered statistically significant.

We reviewed data from the antenatal records of 398 consecutive pregnancies (137 white, 103 black, 158 Asian women; mean age 30 ± 6 years) attending our antenatal hypertension clinic between 1980 and 1995. Two hundred thirty-five women were not taking any therapy during the first 20 weeks of pregnancy, whereas atenolol was taken by 76 women, labetolol by 7, other β blockers by 12, calcium antagonists by 22, diuretics by 26, methyldopa by 17, and angiotensin-converting enzyme inhibitors by 7 women; 18 women were taking multiple drug combinations.

Blood pressures during antihypertensive therapy are summarized in Table I. When compared with untreated cases, there was a trend toward higher mean systolic (1-way ANOVA, $p = 0.064$) and diastolic blood pressures ($p < 0.001$) in the first 20 weeks of pregnancy among women who were taking antihypertensive drugs (Table I). There were no significant differences in mean gestation period for each patient subgroup of treated and untreated women (1-way ANOVA, p = NS).

Mean birth weights, median placental weights, and ponderal index are also summarized in Table I. Babies born to women taking atenolol were significantly lighter (1-way ANOVA, $F = 5.3$, $p < 0.001$)

AmJ Cardiol 1997;79:1436-1438

Effect of *Atenolol* on Birth Weight

Gregory Y.H. Lip, MD, Michèle Beevers, SRN, David Churchill, MD, Lara M. Shaffer, MB, and D. Gareth Beevers, MD

Závěrem lze konstatovat, že podávání atenololu v časné fázi těhotenství může být škodlivé; tato studie tak potvrzuje výsledky předchozí prospektivní malé randomizované studie. Z našich výsledků lze usuzovat, že atenolol nemá být podáván ženám, které se pokoušejí otěhotnět nebo které jsou v časné fázi těhotenství.

Am J Cardiol 1997;79:1436-1438

Prenatální poradenství

- Betablokátory mohou navodit bradykardii, růstovou retardaci a hypoglykémii u plodu; TK snižují méně než blokátory kalciových kanálů

- Typ betablokátoru a dávka mají být pečlivě voleny
  - nejpříznivější údaje má labetalol
  - atenolol je nejlépe nepodávat

Prenatální poradenství

- Je třeba vyloučit sekundární hypertenzi

Etiologie hypertenze u žen

- esenciální
- stenóza renální tepny

  fibromuskulární dysplazie

  M:Ž = 1:8

BMJ

CrossMark

BMJ 2014;348:g2301 doi: 10.1136/bmj.g2301 (Published 15 April 2014)

RESEARCH

Chronic hypertension and pregnancy outcomes: systematic review and meta-analysis

OPEN ACCESS

Kate Bramham *clinical research fellow*, Bethany Parnell *medical student*, Catherine Nelson-Piercy *professor of obstetric medicine*, Paul T Seed *senior lecturer in medical statistics*, Lucilla Poston *professor of Women's Health*, Lucy C Chappell *clinical senior lecturer in maternal and fetal medicine*

Division of Women's Health, Women's Health Academic Centre, King's College London and King's Health Partners, St Thomas' Hospital, London SE1 7EH, United Kingdom

- **55 eligible studies, 795 221 pregnancies**

BMJ 2014;348:g2301 doi: 10.1136/bmj.g2301

Chronic hypertension and pregnancy outcomes: systematic review and meta-analysis

Ženy s chronickou hypertenzí
měly vysokou poolovanou incidenci

- naroubované preeklampsie (25,9 %; 95% CI 21,0 % - 31,5 %)
- císařského řezu (41,4 %; CI 35,5 % - 47,7 %)
- předčasného porodu do 37. týdne těhotenství (28,1 %; CI 22,6 - 34.4%)
- porodní hmotnosti <2500 g (16,9 %; CI 13,1 % - 21,5 %)
- hospitalizace novorozenců na JIP (20,5 %, CI 15,7 % - 26,4 %)
- perinatální úmrtí (4,0 %; CI 2,9 % - 5,4 %)

BMJ 2014;348:g2301 doi: 10.1136/bmj.g2301

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BMJ 2014;348:g2301 doi: 10.1136/bmj.g2301

Prevence preeklampsie

Antiplatelet drugs for prevention of pre-eclampsia and its consequences: systematic review

Lelia Duley, David Henderson-Smart, Marian Knight, James King

39 trials; 30 563 women

- **15% RR of pre-eclampsia**
- **8% RR preterm birth**
- **14% RR fetal or neonatal death**

BMJ 2001;322:329-33

Prevention of Preeclampsia and Intrauterine Growth Restriction With Aspirin Started in Early Pregnancy

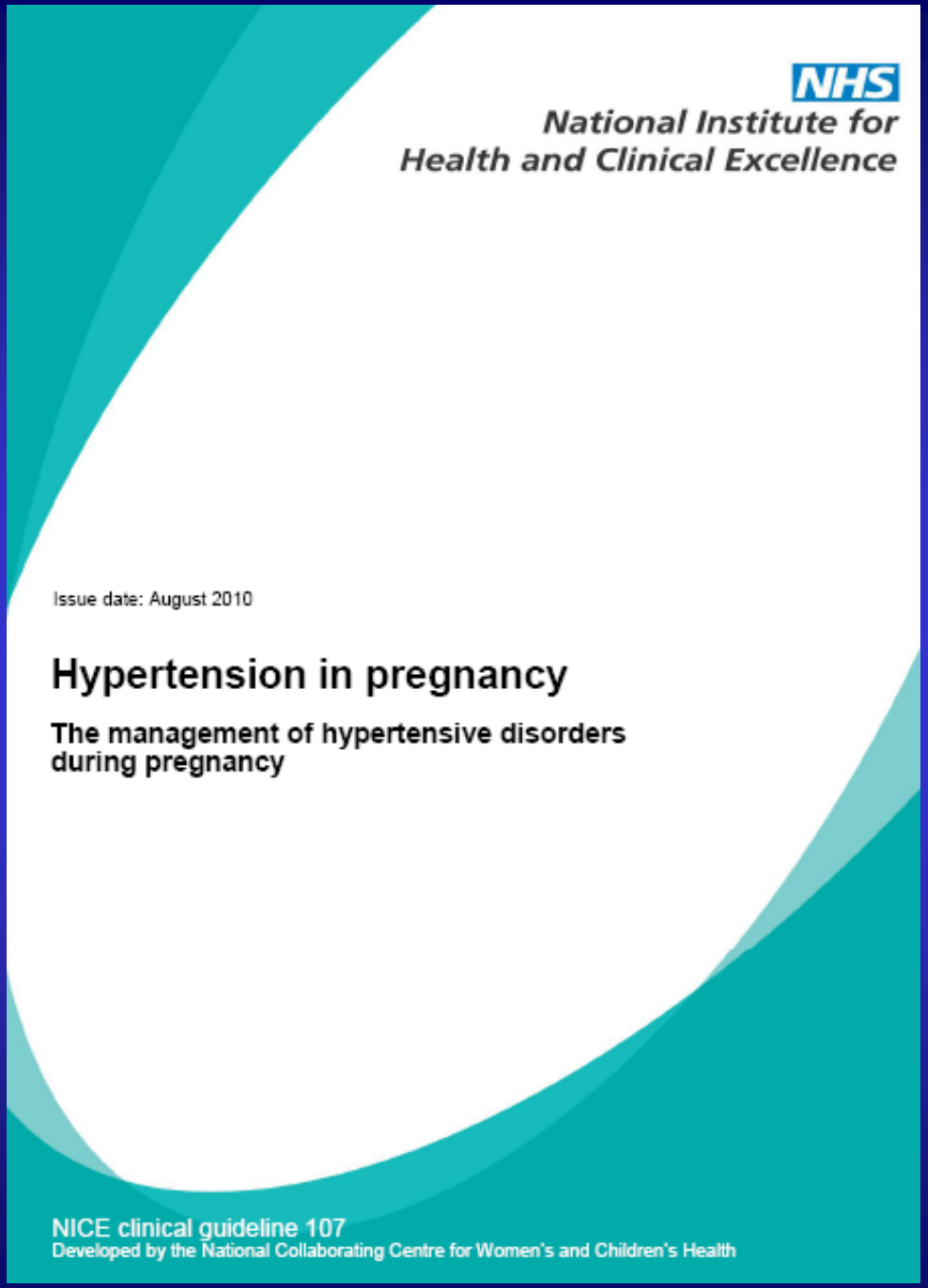
A Meta-Analysis

Emmanuel Bujold, MD, MSc, Stéphanie Roberge, MSc, Yves Lacasse, MD, MSc, Marc Bureau, MD, François Audibert, MD, MSc, Sylvie Marcoux, MD, PhD, Jean-Claude Forest, MD, PhD, and Yves Giguère, MD, PhD

27 studies; 11 348 women

- **53% RR of pre-eclampsia**
- **56% RR of IUGR**

Obstet Gynecol 2010;116:402-14


NHS
National Institute for
Health and Clinical Excellence
Issue date: August 2010
Hypertension in pregnancy
The management of hypertensive disorders during pregnancy
NICE clinical guideline 107
Developed by the National Collaborating Centre for Women's and Children's Health

NICE Clinical Guidelines 107

Antiplatelet agents

Advise women at high risk of pre-eclampsia and those with ≥ 1 moderate risk factor for pre-eclampsia to take 75 mg of ASA daily from 12 weeks until the birth of the baby

High risk

- **Hypertensive disease during a previous pregnancy**
- **CKD**
- **Autoimmune disease such as SLE or antiphospholipid syndrome**
- **Type 1 or Type 2 diabetes**
- **Chronic hypertension**

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 17, 2017 VOL. 377 NO. 7

Aspirin versus Placebo in Pregnancies at High Risk for Preterm Preeclampsia

Daniel L. Rolnik, M.D., David Wright, Ph.D., Liona C. Poon, M.D., Neil O'Gorman, M.D., Argyro Syngelaki, Ph.D., Catalina de Paco Matallana, M.D., Ranjit Akolekar, M.D., Simona Cicero, M.D., Deepa Janga, M.D., Mandeep Singh, M.D., Francisca S. Molina, M.D., Nicola Persico, M.D., Jacques C. Jani, M.D., Walter Plasencia, M.D., George Papaioannou, M.D., Kinneret Tenenbaum-Gavish, M.D., Hamutal Meiri, Ph.D., Sveinbjorn Gizurarson, Ph.D., Kate Maclagan, Ph.D., and Kypros H. Nicolaides, M.D.

- **multicentrická, dvojitě slepá, placebem kontrolovaná studie**
- **1776 žen, jednočetná těhotenství s vysokým rizikem rozvoje preeklampsie před porodem**
- **ASA 150 mg vs. placebo**

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Závěry

Léčba nízkou dávkou ASA u žen s vysokým rizikem rozvoje preeklampsie před porodem byla s nižší incidencí preeklampsie.

Induction of labour versus expectant monitoring for gestational hypertension or mild pre-eclampsia after 36 weeks' gestation (HYPITAT): a multicentre, open-label randomised controlled trial

*Corine M Koopmans, Denise Bijlenga, Henk Groen, Sylvia M C Vijgen, Jan G Aarnoudse, Dick J Bekedam, Paul P van den Berg, Karin de Boer, Jan M Burggraaff, Kitty W M Bloemenkamp, Addy P Drogtrop, Arie Franx, Christianne J M de Groot, Anjoke J M Huisjes, Anneke Kwee, Aren J van Loon, Annemiek Lub, Dimitri N M Papatsonis, Joris A M van der Post, Frans J M E Roumen, Hubertina C J Scheepers, Christine Willekes, Ben W J Mol, Maria G van Pampus, for the HYPITAT study group**

- **Multicentrická, paralelně uspořádaná, otevřená, randomizovaná, kontrolovaná studie v šesti univerzitních a 32 neuniverzitních nemocnicích v Nizozemsku, 2005–8**
- **756 pacientek**
- **Indukce porodu je spojena s příznivější prognózou u matek a má být doporučována ženám s mírnou hypertenzí po 37. týdnu těhotenství.**

Lancet 2009; 374 (9694): 979–988

Management of hypertension (1)

Recommendations	Class	Level
Low-dose aspirin (100–150 mg daily) is recommended in women at high or moderate risk of pre-eclampsia from week 12 to weeks 36-37.	I	A
In women with gestational hypertension or pre-existing hypertension superimposed by gestational hypertension, or with hypertension and sub-clinical organ damage or symptoms, initiation of drug treatment is recommended at SBP >140 mmHg or DBP >90 mmHg. In all other cases, initiation of drug treatment is recommended if SBP ≥150 mmHg or DBP ≥95 mmHg.	I	C
SBP ≥170 mmHg or DBP ≥110 mmHg in a pregnant woman is an emergency, and hospitalization is recommended.	I	C
Methyldopa, labetalol, and calcium antagonists are recommended for the treatment of hypertension in pregnancy.	I	B

Perorální antikoncepce a TK

Perorální antikoncepce a hypertenze

James W. Woods

Perorální antikoncepce je spojena *s mírným zvýšením TK* u většiny žen a *hypertenzi navozuje přibližně u 5 %*. Za zvýšení TK jsou zodpovědny estrogeny i progesteron, ale přesný mechanismus účinku zatím není znám.

***Riziko KV komplikací* je především u žen *ve věku nad 35 let* a u *kuřaček*.**
Přípravky s obsahem estrogenu < 30 µg a progesteronu < 1 mg se zdají být bezpečné.

Hypertension 11 (Suppl II): II-11-II-15, 1998

Blood pressure in women using oral contraceptives: results from the Health Survey for England 1994

Wei Dong, Helen M. Colhoun and Neil R. Poulter

Objective To assess whether the blood pressure is higher among women who take oral contraceptives than it is among those who do not.

Design A cross-sectional survey of a stratified random sample of English adults (aged ⩾ 16 years).

Setting Non-institutionalized households in England during 1994.

Participants From this sociodemographically representative sample of English adults, 3545 premenopausal women, of whom 892 were current users of oral contraceptives, were evaluated.

unchanged after further adjustment for the body mass index, alcohol intake, physical activity and hypertension treatment. Blood pressure differences tended to be larger among older oral contraceptive users. Oral contraceptives containing progestogen only were not associated with higher blood pressures.

Conclusions Despite the fact that most combined oral contraceptives in current use in England contain low doses of oestrogen, slightly but significantly higher blood pressures were observed among oral contraceptive users. Blood pressures should be screened before oral contraceptives are supplied and should be monitored regularly during oral contraceptive use.

J Hypertens 1997; 15:1063-1058

Health Survey for England 1994

	OC+ *n = 892*	*OC-* *n = 2,653*	*p*
Mean age, yrs	27.5	35.5	< 0.001
*BMI, kg/m^2	24.4	24.9	< 0.01
*SBP, mmHg	125.1	122.8	< 0.001
*DBP, mmHg	69.7	68.1	< 0.001
*HR, beats/min	74.1	73.5	0.18

*adj. for age

J Hypertens 1997; 15:1063-1058

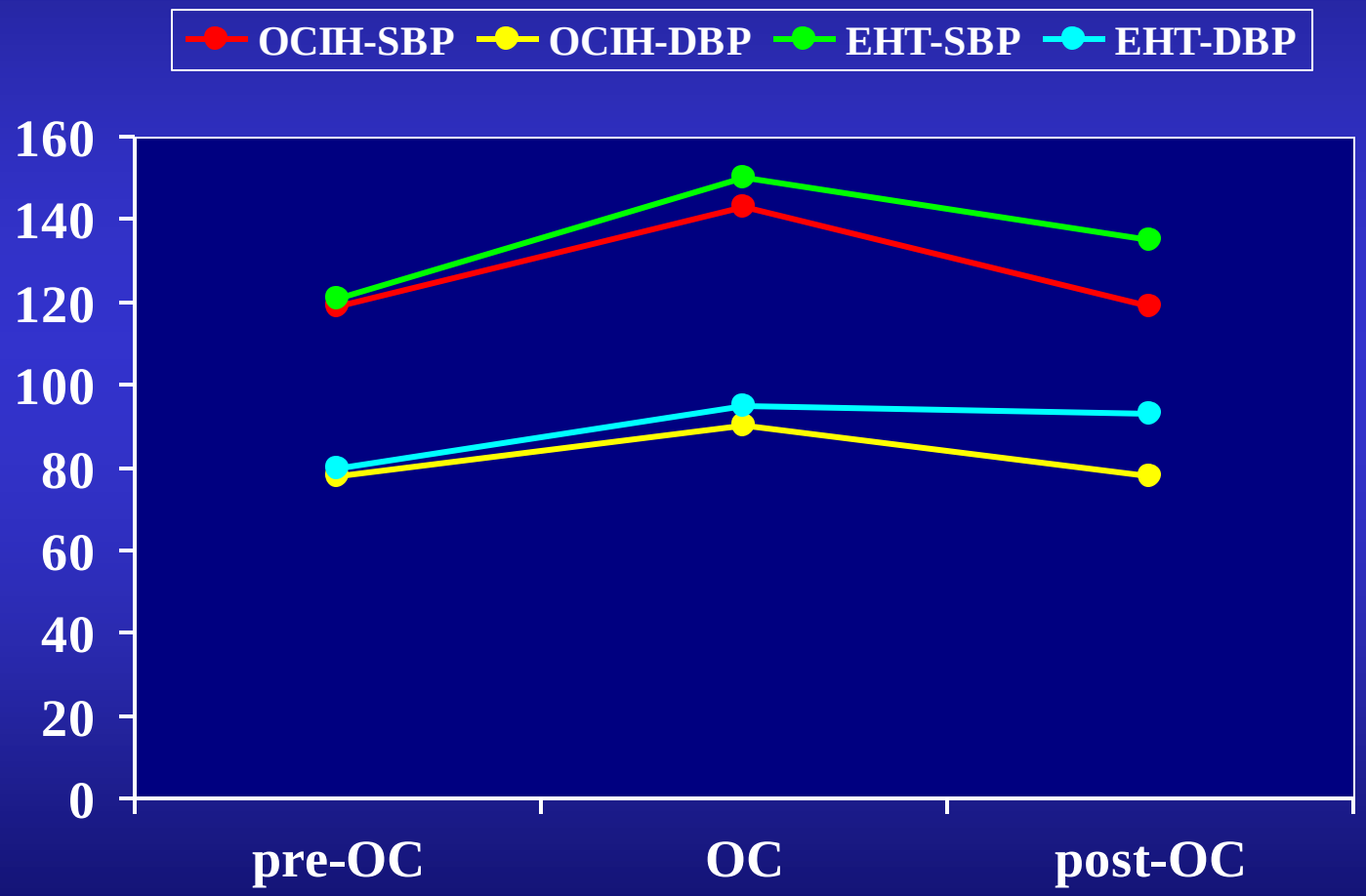
Health Survey for England 1994

BP differences between OC- a OC+

	SBP (mmHg)	*DBP (mmHg)*
OC-	0	0
OC+	2.3 (1.3-3.4)	1.6 (0.8-2.4)
combined OC	2.6 (1.5-3.7)	1.8 (1.0-2.7)
progesteron only	-0.1 (-3.3-2.7)	-0.7 (-2.9-1.6)

J Hypertens 1997; 15:1063-1058

Mean BP pre-, during and post-OC



J Hypertens 2001;19:713-719

RR for hypertension by OC Use
NHS II (1989-1993)

Hypertension	*Never*	*OC use* *Past*	*Current*
Cases, n	211	1,193	163
RR, adj. for age	1.0	1.1 (0.9-1.2)	1.5 (1.2-1.8)
RR, adj. for age and BMI	1.0	1.2 (1.0-1.4)	1.8 (1.5-2.3)
RR, multiple adj.	1.0	1.2 (1.0-1.4)	1.8 (1.5-2.3)

Circulation 1996;483-489

ELSEVIER

Contraception

Contraception 69 (2004) 89–97

Review article

Progestogen-only pills and high blood pressure: is there an association? A literature review☆

Sabina F. Hussain*

London School of Hygiene and Tropical Medicine, London, UK

Received 1 July 2003; revised 4 September 2003; accepted 17 September 2003

Abstract

The progestogen-only pill (POP) is a contraceptive option for women who have high blood pressure either induced by use of combined oral pills or due to other causes; as long as it is well controlled and monitored. Combined oral contraception (COC) and Depo-Provera have been implicated in increased cardiovascular risk following use. High blood pressure has been theorized to be the critical path that leads to this increased risk. POP is the recommended method for women who are at risk of coronary heart disease due to presence of risk factors like hypertension. In order to offer POP as a safe, alternative contraception to women who develop hypertension on COCs or those who are at increased cardiovascular risk, it is important to take into account evidence of no association of high blood pressure with POP use. A search of published medical literature (PUBMED and Cochrane database) was undertaken with this objective. A total of four articles were selected for final review after application of inclusion and exclusion criteria. Three of these were prospective control trials and one a cross-sectional survey. There was no randomized study to answer this question. The results of these studies consistently reported no significant association of high blood pressure with use of POPs for up to 2–3 years of follow-up.

Mechanismy hypertenze navozené hormonální antikoncepcí

- **Změny hemodynamiky:** ↑ tělesná hmotnost
  ↑ plazmatický volum, ↑ SV
- **RAS**
  - estrogeny zvyšují syntézu reninu v játrech cestou exprese mRNA angiotensinogenu
  - ↓ renální průtok (AG II navozuje vazokonstrikci) → retence Na → HT
- **Inzulinová rezistence**
  - hormonální přípravky obsahující 30-40 µg ethinyl estradiolu navozují inzulinovou rezistenci
  - samotný progesteron prodlužuje poločas inzulinu

Doporučení pro užívání hormonální antikoncepce

- **Nepodávat:** - kuřačkám ve věku > 35 let
  - SLE
  - s TEN v anamnéze

- **Podávat s opatrností:**
  - ženám s bolestmi hlavy charakteru migrény

Metody asistované reprodukce

Infertility, fertility treatment, and risk of hypertension

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Nurses´ Health Study

- **Design**: prospektivní kohortová studie
- **Pacienti**: 116 430 zdravotních sester; FU 1993–2011
- **Závěry**: bez zvýšeného rizika rozvoje hypertenze u žen, které byly dříve léčeny pro infertilitu.

Fertil Steril 2015;104:391-7

Increased incidence of gestational hypertension and preeclampsia after assisted reproductive technology treatment

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- **Design:** retrospektivní populační studie
- **Pacienti:** 596 520 matek (3,6 % asist. reprodukce), které porodily 2007–2011
- **Závěr:** *Mnohočetná těhotenství* po asistované reprodukci jsou nejpravděpodobnějším vysvětlením pro zvýšenou incidenci gestační hypertenze a preeklampsie u matek, které se podrobily asistované reprodukci.

Wang YA et al., Fertil Steril 2016

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ORIGINAL PAPER

WILEY

Risk of hypertensive disorders in pregnancy following assisted reproductive technology: overview and meta-analysis

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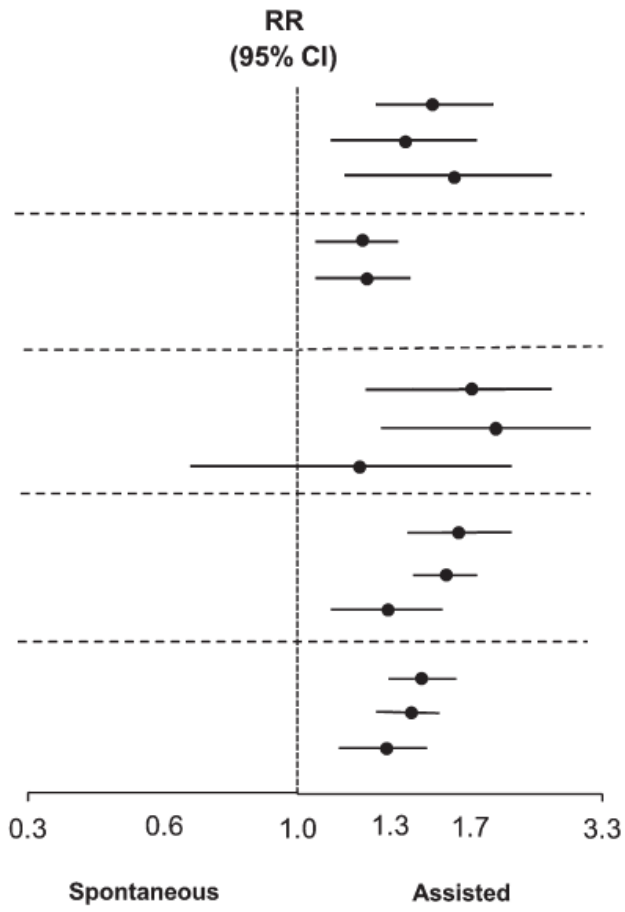
- **66 longitudinálních studií**; 7 038 029 těhotenství
  203 375 po asistované reprodukci
- **Závěry:** Všechny formy hypertenze v těhotenství byly po asistované reprodukci významně zvýšeny, nezávisle na pořadí těhotenství:
  - gestační hypertenze +79 % (95% CI, 24 %–157 %)
  - preeklampsie +75 % (95% CI, 50 %– 103 %)
  - **PHD +54 %** (95% CI, 39 %–70 %)

J Clin Hypertens 2017; 19: 173–183

Hypertenze v těhotenství po asistované reprodukci

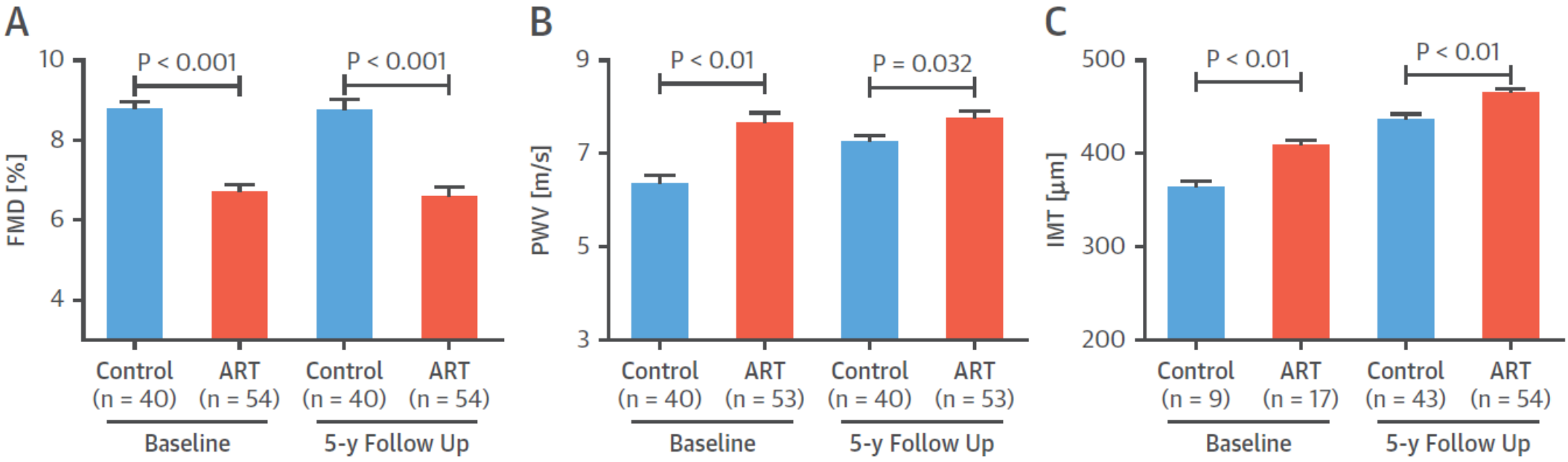
Intervention/Outcome	N of studies	Heterogeneity	Events (n/participants) Assisted	Events (n/participants) Spontaneous	RR (95% CI)	P value
A. OI/PE						
All orders	7	44%, 0.095	332/5209	9623/212965	1.56 (1.27-1.91)	
Singletons	4	71%, 0.017	296/4619	9559/210804	1.48 (1.12-1.96)	.47
Nonsingletons	2	0%, 0.93	33/168	53/503	1.78 (1.19-2.65)	
B. OI/PHD						
All orders	3	0%, 0.39	144/1557	2905/39503	1.24 (1.05-1.45)	
Singletons	2	19%, 0.27	138/1485	2893/39382	1.26 (1.04-1.52)	NA
Nonsingletons	1	NA	-	-	-	
C. Invasive ART/GH						
All orders	8	76%, <0.001	202/2639	2757/68955	1.79 (1.24-2.57)	
Singletons	5	78%, 0.001	129/1764	2348/54685	2.06 (1.30-3.26)	.18
Non-singletons	4	40%, 0.21	51/375	85/700	1.22 (0.67-2.23)	
D. Invasive ART/PE						
All orders	35	95%, <0.001	5030 / 97394	134630 / 4943930	1.75 (1.50-2.03)	
Singletons	17	44%, 0.026	2987 / 72794	75958 / 2888454	1.65 (1.53-1.77)	.005
Nonsingletons	14	67%, <0.001	927 / 10198	2400 / 30555	1.34 (1.10-1.65)	
E. Invasive ART/PHD						
All orders	40	86%, <0.001	9232 / 126494	78695 / 1792440	1.54 (1.39-1.70)	
Singletons	25	76%, 0.001	6083 / 99229	69399 / 1686337	1.47 (1.35-1.61)	.081
Nonsingletons	23	70%, <0.001	3069 / 26180	8446 / 86409	1.33 (1.17-1.51)	



OI = indukce ovulace

J Clin Hypertens 2017; 19: 173–183

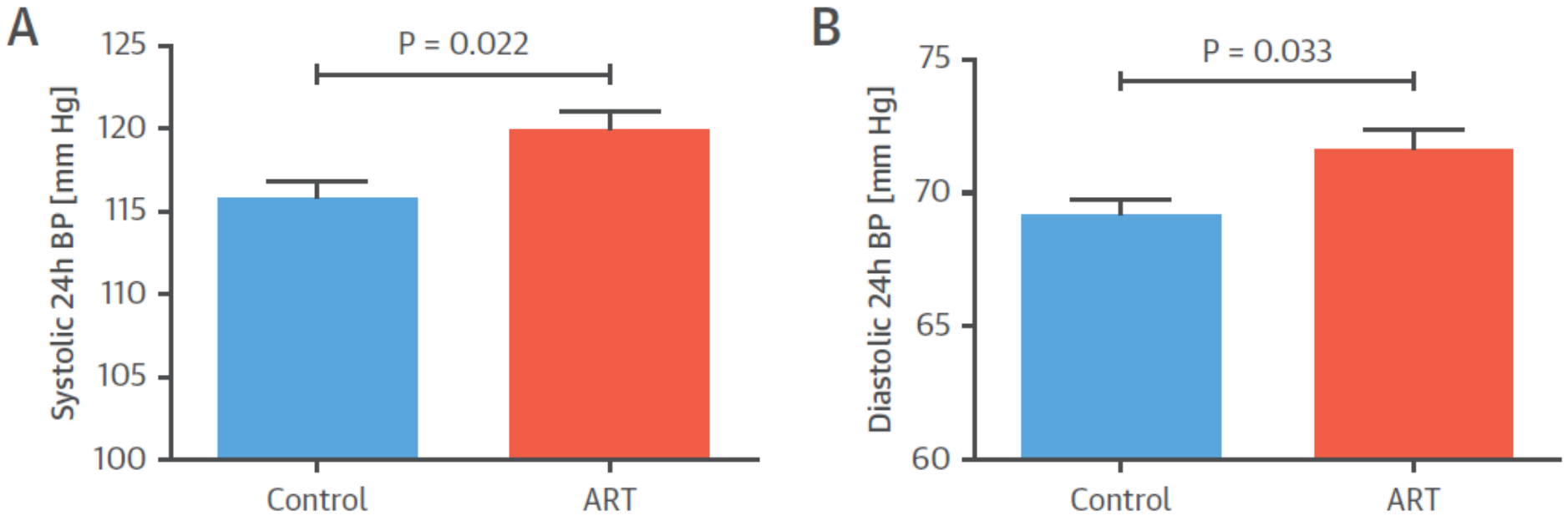
Předčasné stárnutí cév dětí počatých asistovanou reprodukcí přetrvává do období adolescence



(A) Flow-mediated dilation (FMD, **(B)** pulse wave velocity (PVW), and **(C)** intima-media thickness (IMT) at baseline (mean ± SD age, control 11.8 ± 2.2 years; assisted reproductive technologies [ART] 10.9 ± 2.4 years) and at 5-year follow-up (mean age; control 17.6 ± 2.7 years; assisted reproductive technologies 16.6 ± 2.4 year) in subjects conceived through assisted reproductive technologies and naturally conceived control subjects. Premature vascular aging, as evidenced by impaired flow-mediated dilation and by increased pulse wave velocity and intima-media thickness, persists at 5-years follow up in subjects conceived through assisted reproductive technologies. Data are shown as mean ± SD.

JAMA 2018; 72:1267-1274

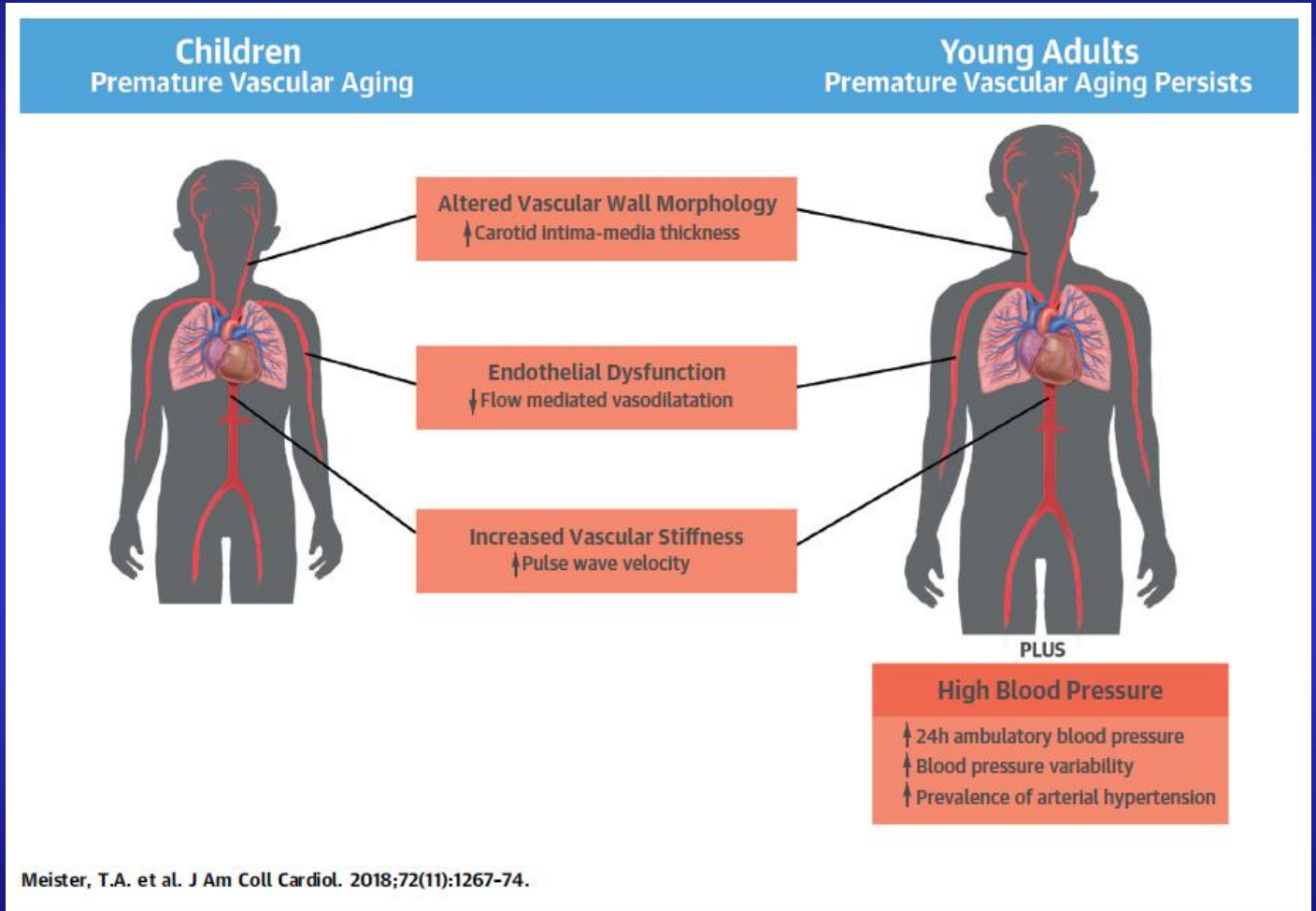
24hod. monitorace TK u osob počatých asistovanou reprodukcí a kontrolních osob



(A) Systolic and **(B)** diastolic 24-h ambulatory blood pressure (BP) was significantly higher in subjects conceived through assisted reproductive technologies (ART) (n = 52) than in control subjects (n = 43). Data are shown as mean ± SD.

JAMA 2018; 72:1267-1274

Změny kardiovaskulárního fenotypu indukované asistovanou reprodukcí



Premature vascular aging detected in children conceived by assisted reproductive technologies (ART) persists in young adults and evolves into arterial hypertension.

JAMA 2018;72:1267-1273

Závěry

- **Hypertenze se vyskytuje u 8-9 % žen v reprodukčním věku, zhruba 50 % z nich je medikamentózně léčeno, proto je důležité prenatální poradenství.**
- **Ženy s preexistující hypertenzí mají horší prognózu včetně vysokého rizika rozvoje preeklampsie – preventivní podávání nízké dávky ASA**
- ***Perorální antikoncepční přípravky s obsahem estrogenů jsou*** **u většiny žen** ***spojeny s mírným vzestupem TK. Hypertenze je většinou mírná*** **a TK se obvykle po vysazení perorální antikoncepce normalizuje.**

Závěry

- Ženy, které otěhotněly pomocí metod asistované reprodukce, mají vyšší riziko rozvoje hypertenze v těhotenství.
- Metody asistované reprodukce navozují předčasné stárnutí cév, které přetrvává u adolescentů bez přítomnosti klasických rizikových faktorů KVO.