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Prevalence of Hypertension during Pregnancy in Benin: Results from STEPS Survey in 2015

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Abstract

Introduction: Hypertension disorders of pregnancy are one of the leading causes of maternal and fetal deaths. We aimed to estimate the prevalence of hypertension among pregnant women having participated in the STEPS survey in Benin in 2015. **Methods:** This was a database analysis. STEPS survey included consenting adults aged 18 to 69 years, living in Benin for at least 6 months prior to the survey. The participants were selected in households by a three-stage random sampling technique. The World Health Organization (WHO) STEPS instrument was used for data collection. After an individual interview with the participant at home, blood pressure was measured according to WHO recommendations. Pregnant women database was extracted for analysis. A multivariable logistic regression was done for associated factors identification. **Results:** A total of 2800 women (out of 5127 people) participated in the STEPS study of which 240 declared to be pregnant. The mean age was 28.9 ± 6.8 years. The prevalence of hypertension was 13.3%. Severe hypertension represented 2.9%. Hypertension during pregnancy was associated with primary school education level (compared to none, adjusted OR = 0.3, 95% CI [0.1 - 0.9], p = 0.042). No significant association was found with behavioral factors. **Conclusion:** The prevalence of hypertension during pregnancy is high in Benin. In-depth studies and targeted interventions for prevention should be implemented.

Keywords

Hypertension, Pregnancy, Benin

1. Introduction

Hypertensive disorders in pregnancy (HDP) constitute a major health concern worldwide because of their frequency, mortality and complex management. They can be classified into four categories: gestational hypertension, preeclampsia-eclampsia, chronic hypertension, chronic hypertension with superimposed preeclampsia [1].

HDP affect globally 5% - 10% of pregnant women and are one of the leading causes of maternal mortality [2]. They were responsible for around 14.0% of maternal deaths in 2014 [3]. Furthermore, preeclampsia-eclampsia may increase the risk of cardiovascular disease after the pregnancy [4].

HDP remain a public health problem in sub-Saharan Africa (SSA), despite progress made in improving maternal health. The pooled prevalence was estimated at 5% - 10% in systematic reviews, similar to the global estimate [5] [6] [7]. The mortality was estimated in 2014 at 16.0% [3]. Benin like most countries in SSA faces high maternal mortality. In 2017, the maternal mortality rate in Benin was 397 deaths (291 - 570) per 100,000 live births versus a world average of 211 (199 - 243) [8]. The report on the emergency obstetric and neonatal care needs in Benin estimated in 2016 that preeclampsia and eclampsia represented the second direct obstetrical cause of maternal deaths (22.5%) [9].

Most deaths attributable to HDP are preventable. Usually, blood pressure (BP) is lower during pregnancy. Hypertension should be detected and managed appropriately before the onset of the preeclampsia and complications. The availability of epidemiological data allows local health systems to elaborate targeted preeclampsia prevention strategies. The WHO STEPwise Approach to NCD Risk Factor Surveillance (STEPS) is a simple, standardized method for collecting, analysing and disseminating data on key NCD risk factors in countries.

We aimed to estimate the prevalence of hypertension and to identify its associated factors among pregnant women in Benin in 2015 from STEPS survey data.

2. Methods

2.1. Study Design, Population and Data Collection

This was a secondary analysis of 2015 Benin STEPS survey data. The methodology of the STEPS survey in Benin in 2015 was previously described [10]. This was a cross-sectional study. It included consenting adults aged 18 to 69 years old, living in Benin for at least 6 months prior to the survey. People who are not able to respond to face-to-face interviews and those not met at home after 2 visits were not included. The study received approval from the National Ethics Committee for Health Research. Data were managed with confidentiality.

Participants were selected using a three-stage random sampling technique. The sampling database was provided by the National Institute of Statistics and Economic Analysis. At the first stage, 260 Enumeration Areas (EA) were randomly selected. Then, the list of households was established per retained EA and 20 households were randomly selected. At the third stage, one person was ran-

domly chosen per household using the Kish method recommended for STEPS surveys [11]. The sample size was estimated at 5123 participants. It was calculated using a spreadsheet designed by the World Health Organization (WHO) to calculate the sample size in the STEPS surveys considering the following parameters: a cluster effect of 1.5; an alpha risk of 5%, a theoretical prevalence of 50%, a relative accuracy of 5%, a predicted response rate of 90% and a stratification effect of 8.

The latest electronic form of the WHO STEPS instrument was used for data collection. It includes information on sociodemographic factors, lifestyle, pregnancy, history of hypertension and the recording of BP values. After an individual interview with the participant (STEP1), BP was measured according to WHO STEPS manual instructions (STEP2) [11]. It was measured in a seated position after at minimal 15-minute rest, in the left arm with an electronic device (Boso Medicus UNO, Bosch & Sohn, Germany) with suitable cuff (22 - 32 cm or 32 - 48 cm). Three consecutive measures at 3-minute interval were taken and BP corresponded to the mean of the last two measurements.

2.2. Variables

The main outcome was "hypertension during pregnancy". Pregnancy was self-reported and hypertension was defined by systolic BP ≥ 140 mm·Hg or diastolic BP ≥ 90 mm Hg or taking antihypertensive drug. Severe hypertension was defined by systolic BP ≥ 160 mm·Hg or diastolic BP ≥ 110 mm·Hg.

The behavioral factors were defined as follows: low fruit and vegetable intake by consumption of less than 5 servings of fruit and vegetable per day; low physical activity practice by practice less than 150 minutes of moderate physical activity or equivalent per week; tobacco consumption by tobacco smoking before or during pregnancy; excessive salt consumption by the report "often or always" for at least one of these questions: 1) "Do you often add salt or a salty sauce like soy sauce to your dish just before or while you eat it?" 2) "Do you often eat cooked meals that are high in salt (salty snacks, salted preserves, savory fast food dishes)?" or "too much" for this question: 3) "How much salt or salty sauce do you think you eat?".

2.3. Data Management and Statistical Analysis

The data of pregnant women were extracted from STEPS database and analysed using Epi Info version 7.1.5.2 software (CDC Atlanta, USA). The categorical variables were reported as proportions. Continuous variables were summarized with means ± standard deviation for normal variables. The proportions were compared between two groups through chi-square or exact Fischer tests. A multivariable logistic regression was performed to identify associated factors with hypertension by using step-by-step downward approach. All variables with a p-value ≥ 0.2 were introduced in the first model. The adjusted odds ratio and their confidence intervals at 95% were determined. For comparisons, p-value

under 0.05 was considered significant.

3. Results

3.1. Characteristics of Sample

A total of 5127 people participated in the STEPS Benin survey of which 2800 were women. Of these, 240 were pregnant. They had a mean age of 28.9 ± 6.8 years with extremes of 18 and 47 years. The sociodemographic data are presented in the two first columns of Table 1. The age group "28 - 37" years was the most represented (50.0%). Almost all (93.7%) were married or lived as a couple. More than half (52.9%) had no formal education and only 16.3% secondary level or more. Most of them (62.3%) practiced liberal activity. The majority (77.1%) had a monthly income below the official minimum wage 80 USD.

None of them reported smoking (Table 2). Alcohol consumption during last 30 days (12.5%), low fruit and vegetable intake (92.9%), low physical activity practice (46.7%) and excessive salt intake (24.2%) were reported (Table 2).

Table 1. Prevalence of hypertension among pregnant women according to sociodemographic characteristics, Benin STEPS survey 2015.

	N (%)	Hypertension			
		n (%)	Crude OR	95% CI	p
Age (years)					0.240
18 - 27	83 (34.6)	11 (13.3)	1		
28 - 37	120 (50.0)	8 (10.8)	0.8	0.3 - 1.9	
38 - 47	37 (15.4)	13 (21.6)	1.8	0.7 - 4.9	
School education level					0.091
None	127 (52.9)	22 (17.3)	1		
Primary	74 (30.8)	5 (6.8)	0.3	0.1 - 0.9	
Secondary or more	39 (16.3)	5 (12.8)	0.7	0.2 - 2.0	
Marital status					0.388
Couple	224 (93.7)	31 (13.8)	1		
Alone/divorced/widower	16 (6.3)	1 (6.3)	0.41	0.1 - 3.3	
Occupation					0.833
Independents	149 (62.3)	21 (14.1)	0.9	0.3 - 3.1	
Housewives	63 (26.4)	7 (11.1)	0.8	0.2 - 2.8	
Others	28 (11.3)	4 (14.3)	1		
Monthly income (USD)					0.546
<80	185 (77.1)	24 (13.8)	1		
≥80	55 (22.9)	6 (10.9)	0.7	0.3 - 1.9	

OR: Odd ratio; CI: Confidence Interval; N: Total number; n: Subgroup number.

Table 2. Prevalence of hypertension according to behavioral characteristics among pregnant women, Benin STEPS survey 2015.

	Hypertension				
	N (%)	n (%)	Crude OR	95% CI	p
Smoking					
No	240 (100.0)	33 (100.0)	-	-	-
Yes	0 (0.0)	0 (0.0)			
Alcohol consumption last 30 days					0.565
No	210 (87.5)	29 (13.8)	1		
Yes	30 (12.5)	3 (10.0)	0.7	0.2 - 2.4	
Low fruits and vegetables intake					0.043*
No	17 (7.1)	5 (29.4)	1		
Yes	223 (92.9)	27 (12.1)	0.3	0.1 - 0.9	
Low physical activity practice					
No	112 (46.7)	15 (11.7)	1		0.431
Yes	128 (53.3)	17 (15.2)	1.3	0.6 - 2.8	
Excessive salt intake					0.905
No	182 (75.8)	24 (13.2)	1		
Yes	58 (24.2)	8 (13.8)	1.1	0.4 - 2.5	

OR: Odd ratio; CI: Confidence interval; N: Total number; n: subgroup number; *statistically significant.

Mean systolic and diastolic BP among non-hypertensive women were 111.9 ± 10.7 mm Hg and 72.6 ± 8.6 mm Hg, respectively, whereas mean systolic and diastolic BP among hypertensive women were 137.1 ± 20.1 mm Hg and 91.7 ± 10.6 mm Hg, respectively.

3.2. Prevalence of Hypertension during Pregnancy and Associated Factors

A total of 28 women had high BP during the survey and 7 were taking antihypertensive drugs; 32 met hypertension criteria defined in this work. The prevalence of hypertension during pregnancy was estimated at 13.3% (95% CI [9.3 - 18.3]). Severe hypertension was noted in 7 women (2.9%).

Hypertension during pregnancy was associated with primary school education level: versus none, adjusted OR = 0.3, 95% CI [0.1 - 0.9], p = 0.042 (Table 3). Pregnant women having primary school level had lower prevalence of hypertension compared to those without school education. No significant association was noted between hypertension during pregnancy and behavioral factors.

4. Discussion

This work focused on pregnant women recruited during the STEPS survey in Benin in 2015, having a mean age about 29 years. It showed that more than tenth

Table 3. Factors associated to hypertension among pregnant women, Benin STEPS survey 2015.

	Hypertension		
	Adjusted OR	95% CI	p
School education level (primary/none)	0.3	0.1 - 0.9	0.042*
School education level (secondary or more/none)	0.7	0.2 - 2.0	0.492
Low fruits and vegetables intake (yes/no)	0.3	0.1 - 1.0	0.052

OR: odd ratio; CI: confidence interval; *statistically significant.

of them had hypertension. The prevalence of hypertension was higher among pregnant women without education compared to others.

The mean age of this sample is in the age range found by other authors in Togo in 2014 (30 years) [12] and in Tanzania in 2015 (27 years) [13].

The prevalence of hypertension during pregnancy (13.3%) in this work was similar to that reported by Baragou *et al.*, in Togo in 2014 (12.3% in a teaching hospital) [12]. It is lower than those reported in Zimbabwe in 2015 (19.4% in Harare maternities) [14], Botswana in 2016 (22.2% in eight of the largest public hospitals) [15], Republic of Democratic Congo in 2016 (26.7% in Kinshasa antenatal clinics) [16], Nigeria in 2017 (16.7% in a teaching hospital) [17], and Ethiopia in 2019 (16.8% in Gondar town public health institutions) [18]. However, it is greater than that reported in Tanzania in 2015 (6.9% in antenatal clinics) [13]. In the others world regions, 9.5% was reported in Iran in 2014 (in a teaching hospital) [19], 10.2% in India (from a community-based study) [20], 7.8% in France in 2020 (pooled prevalence in a review) [21]. The wide variations of the hypertension prevalence during pregnancy could be linked to differences of women's lifestyle depending of cultures, health system performance, methodology and period of the study. Higher prevalence of hypertension during pregnancy in most of hospital-based studies could be explained by the fact that hospitals are referral centers supposed to manage more cases of HDP than peripheral health centers.

In this work, hypertension was not associated with age. However, some previous studies have shown that hypertension during pregnancy increase with the age of pregnant women [12] [13]. Hypertension is associated with the school level in this study. This result is in line with some literature data [22]. Indeed, women with formal education could have more access to health education and could more prevent hypertension during pregnancy. No independent association was found between hypertension and behavioral factors. However, a significant association had been found between hypertension and alcohol consumption in another study conducted in Ethiopia [18]. Elsewhere, it had been noted in a Congolese study that fruit and vegetable intake and physical activity practice are associated with a decrease of pregnancy induced hypertension risk [23].

The work targeted pregnant women from a representative sample of Beninese people in 2015. It provided data on hypertension during pregnancy, which could

inform local authorities and community leaders. The design of the STEPS study (cross-sectional) and the recruitment in households could underestimate the prevalence of hypertension during pregnancy. Indeed, it could be that the complicated cases of hypertension during pregnancy were hospitalized during the visits and were not included in this survey. In addition, some information necessary to categorize hypertension and to explore other associated factors were not available (gynecologic-obstetric history, term of pregnancy, clinical and biological data on pregnancy). More specific studies will deepen the findings and better explore the factors associated with hypertension during pregnancy.

The results suggest the need to implement prevention measures (individual or collective) of hypertension during pregnancy which focus on behavioral factors, early detection and better management. The improvement of school education level is also necessary.

5. Conclusion

This study shows a high prevalence of hypertension during pregnancy in Benin especially among women with low level of education. It highlights the need to implement actions for the prevention of HDP and their complications taking to account level of education.

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Conflicts of Interest

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

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