

Diets Rich in Vegetables and Physical Activity Are Associated With A Decreased Risk of Pregnancy Induced Hypertension among Rural Women from Kimpese, DR Congo

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Abstract

Background: To assess whether the frequency of pregnancy-induced hypertension is low, and vegetables intake and physical activity are protective against pregnancy-induced hypertension onset among rural women from Democratic republic of Congo.

Method: This hospital-based and longitudinal study was carried out within the rural hospital of Kimpese, DR Congo were monitored from January 1st to March 31st 2003 on basis of demographic, diet, physical activity, anthropometry, and blood pressure till the onset of types of pregnancy-induced hypertension and delivery.

Results: Out of 238 black pregnant, the incidence risk of arterial hypertension was 4.6% (n=11) whose 2.9% with Pre-Eclampsia and 1.7% with transient hypertension. Gestity, parity and birth weight of infants were significantly lower among hypertensive mothers, while positive family history and presence of oedemas were more elevated among hypertensive pregnant. The onset of Pre Eclampsia was higher within vendors and inactive women as well as among vegetarians (3.1%) than women with diet high in meat (9.7%).

Pre Eclampsia occurred more ($p < 0.05$) among pregnant with rare daily servings of vegetables (33.3%) than pregnant with 3 or more daily servings of vegetables (3.7%). Physical activity (RR=0.63 CI95% 0.33 to 0.94) and = 3 daily servings of vegetables (RR=8.8 CI95% 0.6 to 0.98) were significant ($p < 0.01$) protective factors against Pre Eclampsia. Eclampsia was not observed.

Conclusion: It is timely to promote diet rich in vegetables overweight reduction and physical activity among pregnant for the prevention of pregnancy-induced hypertension.

Keywords: Pregnancy-induced hypertension, diet high in vegetables, physical activity.

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Introduction

The worsen course of pregnancy induced hypertension (PIH) is well known: high maternal mortality^{1,2} high rates perinatal mortality², prematurity and intrauterine growth retardation³.

According to LONGO-MBENZA (unpublished data), PIH is less frequent and severe in rural areas than urban areas of Kinshasa region, RDC. However, PIH in general and Pre-eclampsie in particular are preventable⁴⁻⁶. Diets rich in vegetables associated with a decreased risk of many chronic diseases^{7,8} could be recommended for prevention of PIH.

To assess whether the incidence of PIH is low, and vegetables intake and physical activity are protective against PIH onset among rural women from DRC, we analysed data monitored from a rural hospital. We evaluated the frequency, the types and other risk factors of PIH.

Material and Methods

Study population

This hospital-based longitudinal study was carried out within the Evangelical Hospital of Kimpese (EHK), which included a series of 487 pregnant consecutively admitted between January 1st 2002 and March 31st 2003 and became mothers. All individuals gave verbal informed consent to be included in this study, which was performed in accordance with the guidelines proposed in the Declaration of Helsinki II.

Kimpese is a rural area with 33037 inhabitants, located between the Port of Matadi and Kinshasa, the capital of DRC. Founded in 1950, EHK has 477 beds of which 110 are allocated to the department of gynecology and obstetrics.

Recorded informations about mothers included age at the admission, residency, height, weight, gestity, abortion, oedema, routes of delivery, blood pressure, parity and gestational age and mortality. The

questionnaire asked participants how often on average they consumed daily servings (three or more servings= often versus <3servings=rare) of vegetables and meat over the past week. Reliability and validity of self-reported dietary intake of pregnant has been validated separately among other members of their families. The Kappa coefficient was 0.88.

Physical activity levels were defined as intense activity among farmers as well as manual workers and inactivity among sedentary professions (employees, vendors, students, housewives). Body mass index (BMI) was defined as weight in Kilograms divided by height in meters squared, so that denutrition (BMI<18.5 Kg/m², normal weight (BMI 18.5-24.9 Kg/m²), overweight (BMI 25-29.9 Kg/m²) and obesity (BMI =30 Kg/m²) were defined⁹.

Tobacco use, alcohol consumption and family positive history of arterial hypertension were considered as risk factors of arterial hypertension.

Procedure

The first trimester of pregnancy of all the series served as a cross-sectional survey for excluding pregnant with chronic arterial hypertension (n=20), not confirmed pregnancy or abortion (n=140), delivery elsewhere (out of EHK) (n=65), and death before the follow-up period (n=24). The cross-sectional survey period served also to gather the baseline data through questionnaires and anthropometry.

The outcomes during the follow-up period were PIH onset during the second and the third trimesters of pregnancy. The types of PIH were defined accordingly to the American College of Obstetricians and Gynaecologists^{10, 11}.

Statistical analyses

Statistical analyses were performed using the EPI INFO version 6.04 and SPSS 10.01 for Windows. Results were presented as percentages for categorical variables and mean \pm standard deviation (SD) for continuous data. Student-t test served to compare means, while Chi-square served to compare percentages. Protection or risk of PIH was assessed by calculating Risk ratio (RR) and its 95% confidence interval (CI95%), using Mantel-Haenszel Chi-square for statistical significance. The minimal statistical significance was defined for p<0.05.

Results

A total of 238 black pregnant (study population) who lived to delivery were investigated in this rural hospital. Baseline characteristics of participants are shown in Table 1.

Out of the study population, 80.3% (n=191), 19.7% (n=47), 73.5% (n=175) and 26.5% (n=63) were respectively married, single, residents within Kimpese and residents out of Kimpese.

Concerning physical activity, 71% (n=169 farmers) had intense physical activity and 29% (n=69) were characterized by inactivity (25 housewives, 29 students and 15 vendors).

Abortion was reported by 10.5% of the study population (n=25), primiparity by 1.3% (n=3), multiparity by 52.5% (n=125), multiple gestity by 55% (n=131), moderate alcohol intake by 4.6%, while Tobacco use was absent. Family histories of arterial hypertension and diabetes mellitus were respectively present among 3.8% (n=9) and 0.4% (n=1) of the study population.

Oedemas of legs were present in 11.3% (n=27) of the study population, and proteinuria in 4.6% (n=7).

The incidence rate of arterial hypertension among these pregnant women was estimated 4.6% (n=11) whose 2.9% represented Preeclampsia and 1.7% Transient or gestational hypertension.

Pregnants with arterial hypertension had lower number of gestity, parity and birthweight of their infants but higher rates of positive family of arterial hypertension and oedemas, while ages, height, and weight were similar between both groups (Table II). There was not significant association between abortion, BMI categories, residency and Preeclampsia onset (results not presented).

Figure 1 shows a significant (p<0.05) and in equal distribution of the incidence rates of Preeclampsia between the different professional categories: the highest rate being observed among vendors (inactive persons).

The incidence rate of Preeclampsia tended (p=0.08) to be lower among mothers with a diet rich in vegetables (3.1% n=6) than mothers with diet rich in meat (9.7% n=3). However, Preeclampsia occurred with higher rate (p<0.05) among mothers with rare daily servings of vegetables (33.3%) than mothers with 3 or more daily servings of vegetables (3.7%).

Table 3 compares characteristics of pregnant with exclusive diet of vegetables and those with exclusive diet of meat: lower height, weight, BMI, SBP, rates of denutrition and overweight, but higher proportions of intense physical activity were observed among pregnant with exclusive diet of vegetables than mothers with exclusive diet of meat.

Figure 2 shows the protective role ($p < 0.01$) against Preeclampsia conferred by 3 or more daily servings of vegetables (versus rare daily consumption of vegetables) and physical activity (active pregnant versus non active pregnant).

Table I. Baseline characteristics of participants

VARIABLES	Mean \pm SD
Age (years)	27 \pm 6.4
Height (m)	1.592 \pm 0.357
Weight (Kg)	56.2 \pm 6.9
Gestivity (n)	3 \pm 2
Parity (n)	3 \pm 2
SBP (mmHg)	105.8 \pm 14.1
DBP (mmHg)	69.3 \pm 9.5

Table II. Differences in characteristics at the baseline and the diagnosis of arterial Hypertension (HT)

Variables	Presence of HT N, mean or %	Absence of HT n, mean or %	P
Age (years)	25.5 \pm 7.2	27.4 \pm 6.4	NS
Height (m)	1.557 \pm 0.089	1.571 \pm 0.061	NS
Weight (Kg)	56.2 \pm 10.1	56.2 \pm 6.8	NS
BMI (Kg/m ²)	22.9 \pm 2.1	22.7 \pm 2	NS
Gestivity (n)	2 \pm 1	3 \pm 2	<0.05
Parity (n)	2 \pm 1	3 \pm 2	<0.05
SBP (mmHg)	148.2 \pm 16	103.9 \pm 10.8	<0.0001
DBP (mmHg)	93.6 \pm 5.1	68.3 \pm 8.2	<0.0001
g) Birth weight of infants	2341 \pm 657	2817 \pm 543	<0.05
Ht in family	72.7%	1.8%	<0.0001
Caesarean operation	42.9%	13.6%	<0.05
Oedemas	63.6%	8.8%	<0.0001
Overweight	42.9%	10.2%	<0.01

NS : not significant, $p > 0.05$ n= number.

Variables	Exclusive diet of vegetables	Exclusive diet of meat	P
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Table III. Characteristics and diets of mothers

Height (m)	1.567 \pm 0.061	1.588 \pm 0.065	0.07
Weight (Kg)	55.6 \pm 6.7	59.4 \pm 7.9	<0.01
BMI (Kg/m ²)	22.6 \pm 1.8	23.5 \pm 2.6	<0.08
SBP (mmHg)	105.1 \pm 13.1	111.9 \pm 20.1	<0.05
DBP (mmHg)	69.1 \pm 6.2	71.6 \pm 11.9	NS
Intense physical activity (%)	80.2	16.1	<0.0001
Denutrition (%)	1.6	3.2	<0.01
Overweight (%)	10.4	32.3	<0.01

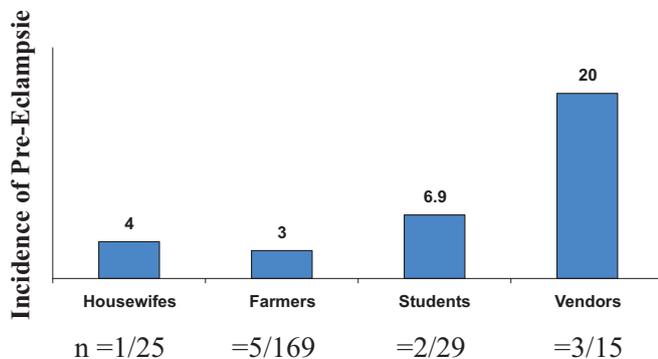


Figure 1. Incidence of Pre Eclampsie by professions of mothers

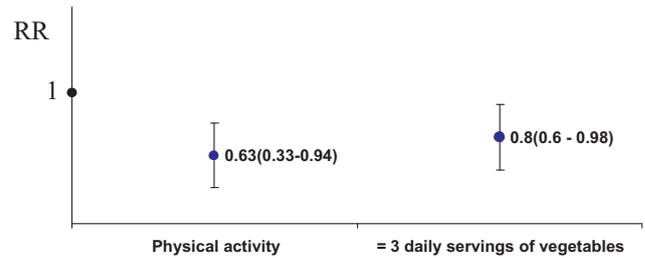


Figure 2. Protection of Pre Eclampsie incidence conferred by physical activity and diet rich in vegetables

Discussion

According to the impression of LONGO-MBENZA (unpublished data) gained from rural pregnant living in the region of Kinshasa, the capital of DRC, the present data demonstrated a very low frequency of PIH in general and that of Preeclampsia. Furthermore, eclampsia, severe complication of PIH, was not observed among these rural Congolese pregnant. As this study was conducted during a short period of 6 months, its PIH incidence should not be compared with rates from literature.

Despite the rarity of severe gravidic toxemia (eclampsia) in this rural area, women with PIH might develop later a permanent arterial hypertension¹² that is a major traditional cardiovascular risk factor¹³. In the general population of this region of Kimpese, DRC, arterial hypertension is more prevalent among women than men from the Kuzi village¹⁴. Given the rapidity with which traditional diets and lifestyles are changing in Sub-Saharan Africa in general and in DRC in particular, it is not surprising that non communicable and chronic diseases (arterial hypertension, cardiovascular diseases, obesity, and diabetes mellitus) are emerging where infections, food insecurity and undernutrition persist according to epidemiologic¹⁵, demographic¹⁶ and nutrition¹⁷ transitions.

Thus, the present study had adopted a common risk-factor approach to chronic disease prevention as a major development in the thinking behind an integrated health policy. Indeed, PIH needs also for global risk factor surveillance¹⁸. It suggests integrations between genetics and environment in PIH onset. While age, a well known non modifiable risk factor for PIH¹⁹, was not significantly associated with PIH in the Kimpese rural region, many of the risks associated with age are modifiable. Such risks include low birthweight, gestivity, parity, behavioural factors (e.g. diet, physical inactivity, Tobacco use, alcohol consumption), and societal factors, interacting with socioeconomic, cultural and other environmental parameters.

Onset of PIH in these rural women might be explained by non modifiable genetic susceptibility as pregnant with PIH have higher rate of positive family history of arterial hypertension than their normotensive counterparts. The role of heredity in the pathogenesis of arterial hypertension²⁰⁻²² and in the cardiovascular disease²⁰ is a biological plausibility. Women with PIH had lower number of gestity (mean=2±1), parity (mean=2±1), and birthweight of their infants (mean=2341±657 g), both age related and preventable parameters. Primigestity plays an important role in the pathophysiology of PIH (23), while low birthweight with an ongoing programming process is a risk factor of arterial hypertension among our Congolese adolescents²⁴. Personal history of caesarean section (generally indicated by PIH complications) is more prevalent among women with PIH than normotensive pregnant. However, Tobacco use and alcohol intake, behavioural risk factors of PIH²¹ are not identified as risk factors of PIH in this study. Socio-cultural background explains the observed rarity of those behavioural risk factors among women from developing countries.

As reported in Benin²⁵, West Africa, the present study showed higher rate of vendors among pregnant with PIH. This vendor profession is more prone to physical inactivity (sedentary), westernization (affluent social class, salt, alcohol, meat consumption), and overweight obesity. In this study, overweight was more prevalent among pregnant with PIH than their normotensive counterparts. However, obesity is still uncommon among these rural pregnant.

As hypothesized, both physical activity and diet rich in vegetables (=3 daily servings of vegetables) are the significant protective factors against Preeclampsia. Compared to pregnant with exclusive diet of meat,

pregnant with exclusive diet of vegetables (vegetarians) were characterized by higher rate of intense physical activity (farmer), but lower rates of BMI, SBP, denutrition, and overweight. The simultaneous presence of denutrition and overweight means that these rural women are experiencing the nutrition transition (17). These results urge the necessity to consider physical activity alongside the complex of diet, nutrition and mother health. Indeed, physical activity and diet are both specific and mutually interacting behaviours that are and can be influenced partly by the same measures and policies (26, 27). Meat favours the onset of Preeclampsia (30). Physical activity should be promoted in these high risk rural women from delivery to the elderly. Avoiding overweight is important in these women. Prospective epidemiological studies have shown that a sedentary lifestyle is associated with an increased risk of cardiovascular disease and with early mortality multiplied by 2 (28, 29). As other researchers had identified intensive physical activity as a significant PIH risk factor (25), moderate physical activity of pregnant should be professionally supervised.

Limitation

The interpretation of these findings must be cautious as the period of the study was short and the multivariate analysis was not performed because of colinearity. The farmers may consume more vegetables or meat than other participants. The multivariate analysis is necessary for adjustment and excluding many biases.

Conclusion

In order to achieve the best results in preventing PIH, the strategies and policies that are applied must fully recognize the essential role of diet rich in vegetables, overweight reduction and physical activity promotion.

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