Journal of
Community & Public Health Nursing

Kabore and Lazar, J Comm Pub Health Nurs 2016, 2:3
DOI: 10.4172/2471-9846.1000130

Research Article Open Access

Prevalence and Risk Factors for Pre-Hypertension Among Adults in Burkina Faso, West Africa

Talato Kabore* **and John Lazar**

School of Nursing, Shepherd University, 320 N. San Fernando Road, Los Angeles, CA, USA

***Corresponding author: Talato Kabore**, Ph.D., Adjunct Professor, School of Nursing, Shepherd University, 320 N. San Fernando Road, Los Angeles, CA, USA, Tel: 1-626-224-5007; E-mail: kabore.ktalato@gmail.com

Received date: June 24, 2016; **Accepted date:** July 15, 2016; **Published date:** July 22, 2016

Abstract

Objectives: To identify the prevalence and risk factors for adults in Burkina Faso, West Africa.

Methods: Data were collected by using three surveys with physical, blood pressure measurements and lipid profile tests in a cross sectional study design. Multiple logistic regression and Structural Equation Modeling techniques were used to analyze data.

Results: The overall prevalence of low and high range prehypertension was 41% and 59% respectively. The causal modeling analysis demonstrated that 10% of the variance in pre-hypertensive event was explained by sociocultural factors; and 4.3% by the psychological factor. Lastly, 22.7% of the variance in pre-hypertensive SBP/DBP event was explained by the developmental factors. Unlike other studies, alcohol use was not significantly associated with prehypertension in this study, and also lipid levels did not significantly predict prehypertensive SBP/DBP.

Conclusion: Developmental factors, household income, waist-to-hip ratio in women, obesity, being widowed, and religious beliefs were predictors for pre-hypertension in the sample. The findings provide preliminary data for future intervention research targeting prevention and/or reduction of pre-hypertension among adults in Burkina Faso.

Keywords: Prevalence; Risk factors; Pre-hypertension; Adults; Burkina Faso

Introduction

The prevalence of pre-hypertension varies widely in West African countries; a population-based sample prevalence was 40% in Ghana and 58.7% in Nigeria [1,2]. In northern Nigeria the prevalence of pre-hypertension was 58.7% (men 59.2%, women 58.2%) from a sample of 782 subjects (age 38.9 ± 13.9 years) from the Hausa and Fulani ethnic groups [2]. Comparatively to the Nigerian study, the Ashanti region of Ghana's study showed that the prevalence of pre-hypertension was 40% in a sample of 1,431 participants aged 18 years or older [1]. As a precursor to hypertension (i.e., ≥ 140/90 mmHg), pre-hypertension constitutes a new risk of major cardiovascular diseases and is clinically stratified in two subcategories: (a) a low subcategory with a blood pressure (BP) of 120-129/80-84 mmHg and (b) a high subcategory with a BP of 130-139/85-89 mmHg [3,4]. Adults with pre-hypertension have a greater risk for stroke, heart failure, and coronary heart diseases as compared to adults with normotensive BP [5-7]. In Burkina Faso, with a population of 16,284,000 the adverse consequences of pre-hypertension are emerging as significant health issues among adults [8]. Specifically, stroke and coronary heart diseases are trending upward, representing 3.36% and 2.79% of total causes of deaths respectively among the top 50 causes of death [9,10]. Stroke also ranked as the second cause of death representing 146.02 deaths per 100,000, while coronary heart diseases were ranked as the third cause of death representing 120.30 per 100,000 populations [8].

But, there is a paucity of population-based data on prevalence and risk factors for pre-hypertension in Burkina Faso. Prevalence and risk factors are preventable and measurable upon investigation and might be responsive to early intervention with educational approaches. Knowledge of risk factors for pre-hypertension can then be used to shift the effects of foremost risks associated with the disease. Identifying the risk profiles is an essential precondition for selecting effective prevention measures.

Sample, Methods, Data Analysis

Study participants

The study used a cross-sectional design. A convenience sample of adult participants were recruited from the health district of Pissy in the Regional Health Department of Center (RHDC) of Burkina Faso. Pissy health district population was 638,234 inhabitants including 165,303 women and 148,070 men [11]. The accessible adult participants were the portion of the target population who met the following inclusion criteria: adults age 18-60 years having a BP between 120-139/80-89 mmHg based on the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure's

(JNC-7) definition of pre-hypertension, able to read and write in French or English with a minimum primary school education, and resident in Pissy Health District. Exclusion criteria included: BP greater or lesser than 120-139/80-89 mmHg; taking anti-hypertensive and anti-diabetes mellitus medications; having history of stroke, myocardial infarction, angina, and other chronic diseases; travelers; hospitalized; or adults with impaired cognitive abilities such as inability to communicate verbally.

Data Collection

Study approval was first secured from the Azusa Pacific University Institutional Review Board (IRB) (Azusa, California, USA) and the National Health Ethics and Human Right Committee of Regional Health Department of Center in Burkina Faso. The investigation took place between July10th and August 23rd 2013 in the urban health district of Pissy. Survey data were collected by trained research assistants. At the same time physical measurements (weight, height, waist and hip circumference), blood pressure measurements, and blood drawings (lipid test) were performed in the Pissy district health centers.

Instruments

Three survey instruments were used for data collection in this study. First, the WHO STEPS wise approach to surveillance (WHO STEPS) is a simple, standardized method for collecting, analyzing, and disseminating data in WHO member countries where the instrument has been validated in 22 African countries, predominantly in urban and rural settings. The WHO STEPS instrument assesses cardiovascular disease risk factors among adults in developing countries and helps researchers to strengthen their capacity to conduct surveillance [12]. Second, the Spiritual Well-Being Scale (SWBS) developed by Paloutzian and Ellison with 10-item subscales has two dimensions of spiritual well-being: (a) vertical dimension that focuses on the person's sense of well-being in relation to God and (b) horizontal dimension that focuses on a person's life purpose perception and satisfaction [13]. Each of 20 items is rated on a 5-point Likert scale ranging from 0 (strongly disagree) to 5 (strongly agree); 10 items address religiosity (RWBS) and 10 address the spiritual existential aspect (EWB). The original Cronbach's coefficient alpha estimates for the SWBS was 0.89; religiosity subscale 0.87; and spiritual subscale 0.78 [13]. For this study, a split-half coefficient as a Spearman-Brown corrected correlation and coefficient alpha were used to computer the internal consistency. Value for coefficient alpha was 0.737 for the SWBS, while the split-half coefficient was 0.744 for the RWB and 0.53 for the EWB. Finally, the Perceived Stress Scale (PSS-10) developed by Cohen, Kamarck, and Mermelstein consists of 10 items which rate stressful events in the respondent's life over the past month [14]. Each item is rated on the scale of 0 to 4; 0 for never to 4 for very often. Its internal consistency coefficient was found to be 0.75 while the coefficient reliability in this study is 0.68 which indicated satisfactory consistency for the PSS. The PSS was used to rate the level of psychological stress of adults in Burkina Faso.

Data Analysis

Data were analyzed using statistical analysis (SPSS) version 21.0 [15]. Descriptive analysis was used to present a quantitative description of the variables. Inferential analysis was used to corroborate the correlations and prediction of pre-hypertensive SBP/DBP event from spiritual variables. Pearson Product-Moment correlation was used to determine the relationship between the high pre-hypertension and spiritual/religious variables, while multivariate logistic regression was applied to determine best predictors for pre-hypertensive SBP/DBP events in the adults. Significant variables were confirmed by multivariate analysis using the forward stepwise method to determine the best predictors and to select a fitting model (criteria for level of significance were set at 0.05 or less).

Results

Demographics, lifestyle and lipid testing

Most participants were currently married (75%) compared with 13% who never married. The remaining participants were cohabitating (10%), widowed (1%), and divorced (1%). Most participants had a high level of education, 6 years or more college education (24%) and university education (66%) compared with high school education (9%). The participants' household income levels per month ranged from $120 to $1,800 with average income $608 and SD=$310. Fifty-five percent reported a household income per month less than $500 compared to 37% who reported a household income between $500 and $1,000. Only 8% reported more than $1,000 (Table 1). Participants' lifestyle behaviors revealed that 12% of the sample smoked with 11% as daily smokers (Table 2). The majority of participants (75%) drank alcohol (beer, local beer, wine, and whisky). All participants reported that they usually use vegetable oil for meal preparation, while 89% reported eating vegetables every day in a week. Forty-one percent of the participants do not eat any fruits in a given week compared to 59% who consume fruits daily. While 53% of the participants were not involved in moderate physical activities at workplace, 44% abstained from moderate physical activities such as walking and riding bicycle; and 53% also remained physically inactive outside of the workplace (Table 2). The body mass index (BMI) of participants was computed from reported weight in pound and height in inches; 38% were overweight and of these, 19% were obese compared with 41% of those who had a normal weight. Only 1.3% of them were either underweight or severely obese. Based on the lipid blood tests (triglycerides, total cholesterol, high density of lipoprotein (HDL-C) and low density lipoproteins (LDL-C), 29% of participants showed borderline high and 12% with high total cholesterol values (Table 3).

Characteristics of Participants	Frequency	Proportion (%)
Age Category		
20-30	9	6
30-40	66	44
40-50	52	35
50-60	23	15
Residence		
CHSPC Rural	29	19
CHSPC Urban	121	81
Gender		

Female Adults	98	65
Male Adults	52	35
Education		
Primary School	1	1
High School	14	9
College	36	24
University	99	66
Marital Status		
Never Married	20	13
Currently Married	113	75
Divorced	2	1
Widowed	2	1
Cohabitating	13	10
Household Income per Month		
Low income<$500	83	55
Middle income $500 to $1000	55	37
High income>$1000	12	8

Table 1: Socioeconomic characteristics of female and male adults with pre-hypertension in the health, district of Pissy, Burkina Faso (N=150), CHSPC: Community Health and Social Promotion Center.

Characteristics of Participants	**Frequency**	**Proportion (%)**
Smoking Status		
Current Smoker		
No	132	88
Yes	18	12
Daily Smoker		
No	133	89
Yes	17	11
Drinking Status		
Alcohol		
Yes	112	75
No	38	25
Physical Activity in Workplace		
Intensive		
Yes	47	31
No	103	69
Moderate		
Yes		
No		53
Physical Activity by Walking/Bicycle		
Yes	84	56
No	66	44
Sport/Fitness		
Yes	70	47
No	80	53
Diets with Vegetable		
Yes	134	89
No	16	11
Diets with Fruits		
Yes	89	59
No	61	41
Diet		
Eating outside the Family	106	71
Eating within Family	44	29

Table 2: Lifestyle behaviors of female and male adults with pre-hypertension in the health district of Pissy, Burkina Faso (N=150).

Characteristics of Blood Tests'	**Values used U.S. (mg/dL)**	**Values used Europe/Burkina (mmol/L)**	**Frequency**	**%**
Total Cholesterol				
Desirable	<200	<5.2	58	38.7
Borderline High	200-239	5.2-6.2	73	48.7
High	≥ 240	>6.2	19	12.7
HDL-C				
Poor	40 (M)			
50 (W)	1 (M)			
1.3 (W)	33	22		
Better	50-59	1.3-1.5	74	49.3
Best	>60	>1.5	43	28.7
LDL-C				
Ideal high risk	<70	<1.8	3	2
Ideal risk	100	<2.6	12	8
Near ideal	100-129	2.6-3.3	59	39.3
Borderline high	130-159	3.4-4.1	50	33.3
High	160-189	4.1-4.9	22	14.7
Very high	>190	>4.9	4	2.7

Triglycerides				
Normal	<150	<1.7	44	29
Borderline high	150-199	1.7-2.2	39	26
High	200-499	2.3-5.6	66	44
Very high	>500	>5.6	1	1

Table 3: Frequency distribution of 150 male and female adults' blood test, HDL-C: High Density Lipoprotein; LDL-C: Low-Density Lipoprotein.

Prevalence of hypertension

Among the 150 male and female adults, the overall prevalence of low prehypertension (120-129/80-84 mmHg) was 41% (n=62) and high pre-hypertension (130-139/85-89 mmHg) was 59% (n=88) in terms of systolic and diastolic blood pressure respectively (Table 4). Among the 121 participants in the urban area of the health district of Pissy, the prevalence of low and high pre-hypertension was 41% and 59%, respectively, in terms of diastolic and systolic blood pressure. In the rural area, where 29 adults participated, the prevalence of low and high pre-hypertension was also 41% and 59% in terms of diastolic and systolic blood pressure.

Pre-hypertensive levels	L Pre-HTN	H Pre-HTN	L Pre-HTN	H Pre-HTN
Overall Prevalence	41%	59%	41%	59%
Health District Areas				
Urban (n=121; male, 35%)	41%	59%	41%	59%
Rural (n=29; male, 35%)	41%	59%	41%	59%
Gender				
Women (98)	40%	60%	36%	64%
Men (52)	42%	58%	50%	50%

Table 4: Prevalence of pre-hypertensive levels among female and male adults in the health district of Pissy, Burkina Faso (N=150), L=Low, H=High; pre-HTN=Pre-hypertension.

Regarding gender, the prevalence of low and high pre-hypertension was 40% and 60%, respectively, among the 98 women with systolic blood pressure compared to 36% and 64% respectively for the diastolic blood pressure. Of the 52 adult male participants, the prevalence of low and high pre-hypertension was the same, 50% in terms of diastolic blood pressure, and different, 42% and 58%, for the systolic blood pressure.

Intrapersonal Risk Factors

A binary logistic regression was used to estimate the probability of prehypertension event among male and female adults. Six predictor variables of age, gender, education, ethnicity, household income, and marital status from the developmental variables were used in the analysis. The risk of having pre-hypertension was (OR=2.36) 95% CI [1.19; 4.66] as great among those with a low household income (<$500 per month) compared with those who are living with a middle household income (>$500 to $1,000 per month) and higher household income (>$1,000).

Developmental predictor variables of BMI (lb/in2), waist and hip circumference, and waist-to-hip ratio for women and men were analyzed. Forward stepwise or likelihood ratio was performed, and BMI was significantly related to the likelihood of having an event of pre-hypertension. The risk of having pre-hypertension was nearly six times as great among those who were overweight and obese compared with those who were normal and underweight, OR=5.91, 95% CI [0.06; 0.55].

Developmental predictor variables of BMI (lb/in2), waist and hip circumference, and waist-to-hip ratio for women and men were analyzed. Forward stepwise or likelihood ratio was performed, and BMI was significantly related to the likelihood of having an event of pre-hypertension. The risk of having pre-hypertension was nearly six times as great among those who were overweight and obese compared with those who were normal and underweight, OR=5.91, 95% CI [0.06; 0.55].

The standardized regression coefficients (beta) were estimated for the pre-hypertensive SBP event (Figure 1). Four endogenous variables from the developmental variables including obesity, overweight, waist-to-hip ratio in women, and household income (<$500) predicted the pre-hypertensive SBP event. The partial standardized regression coefficient depicted by the pathway of the four endogenous variables indicated the following model hypothesis. The model hypothesizes that the increase in overweight (β=0.01), obesity (β=0.05), and waist to-hip ratio (β=0.18) and the decrease of household income (<$500; β=0.06) are associated with increased incidence of pre-hypertensive SBP in adults.

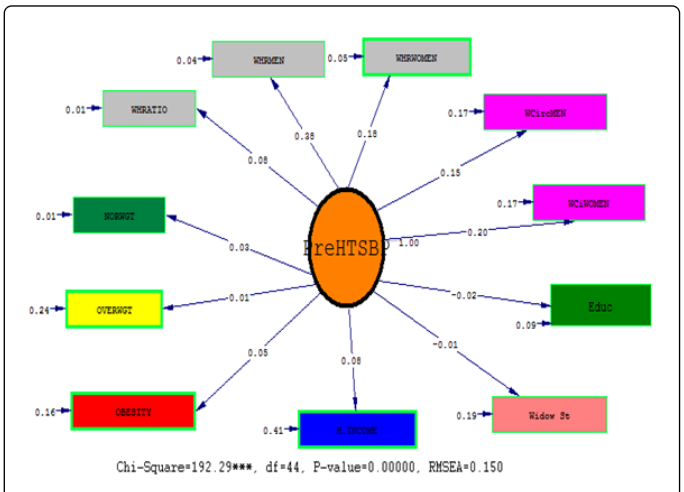

Figure 1: Path diagram for hypothesized model from developmental variables.

Extrapersonal risk factors

Logistic regression was used to estimate the probability of a pre-hypertensive event from the sociocultural variables. The variables included diets, physical inactivity, cigarette smoking, and alcohol consumption.

Diet

Three variables – eating vegetables, number of fruits eaten per day, and number of meals eaten outside – were used in the logistic regression analysis. After stepwise analysis, the number of fruits eaten per day was significantly related to the pre-hypertension incident.

Physical inactivity

Variables from physical activity were analyzed using the logistic regression process. Seven predictor variables (amount of physical activity per week, moderate physical activity involved in workplace, intensive physical activity involved in workplace, physical activity through walking or riding bicycle, sport or fitness, moderate activity per day) predicting pre-hypertensive SBP. measured at the outset of the study, were used in the analysis. Performing the Likelihood Ratio or stepwise method, one variable was significantly related to the probability of having pre- hypertension: moderate physical activity involved in the workplace 2 (1, N=150)=7.31, p=0.007. The risk of a pre-hypertensive event was nearly three times as great among those who had no physical activity in workplace compared with those who did, OR=2.81, 95% CI [1.28; 5.89], p<0.009.

Cigarette smoking

Four predictor variables of cigarette smoking, the number of cigarette smoked per day, the starting age of cigarette smoking, the daily smoker of cigarette, and the current smokers, were used in the analysis. After performing the stepwise method, none of the four variables was significant related to the event of pre-hypertension.

Alcohol consumption

In addition, a logistic regression analysis was conducted to predict the pre-hypertensive event using three predictor variables of alcohol consumption such as alcohol average consumption, average standard drink, and the number of occasions of drink. The overall predictive model was not significant to predict pre-hypertensive event.

Spirituality/religion

Ten predictor variables of religious well-being from SWBS were used in the analysis. The likelihood ratio (LR) was performed, and one ('failure in belief that God is concerned about my problems') of the predictor variables of the scale was significantly related to the likelihood of event of pre-hypertension. In addition to the religious variables, 10 variables of spirituality from the SWBS were analyzed across the logistic regression. The results showed that failure in 'relation with God contributes to my sense of well-being' was significantly related to the likelihood of pre-hypertension event.

Perceived stress

Logistic regression was performed simultaneously to predict the effect size of all the variables or each variable on the incident of pre-hypertension among the male and female adults. In the Perceived Stress Scale, the item, 'feeling nervous and stressed in the last month' was a predictor of pre-hypertensive SBP event (p=.028).

Lipid test

Total cholesterol, triglycerides, LDL-C and HDL-C did not significantly predict pre-hypertensive systolic and diastolic BP in the sample population.

Discussion

In this study, fifty-nine adults had high pre-hypertension (130-139/85-89 mmHg). Qureshi et al. (2005) suggested that high pre-hypertension increases the risk for stroke, and adults with high pre-hypertension have 79% chance to significantly increase stroke risk [26]. In this study, 59% of the adults with high pre-hypertension have an increased risk for stroke event by 79% during their lifespan. This prevalence of pre-hypertensive levels remained proportionately equal between urban and rural areas of the health district which could mean that adults in different areas of the health district are affected by the same factors.

The prevalence of low pre-hypertension was slightly higher in men than women, while the prevalence of high pre-hypertension was higher in women than men. Conversely, in pre-hypertensive DBP, the prevalence of low pre-hypertension was lower in women than men, whereas the prevalence of high pre-hypertension was proportionately higher in women than men. As the results indicated, the prevalence of pre-hypertension was specified in terms of low and high pre-hypertensive SBP and DBP levels which allowed assessing the variation among men and women. Among participants, high pre-hypertension (130-139/85-89 mmHg) was predominant compared to low pre-hypertension. Women were more likely to have higher pre-hypertension than men in this study. This challenges the traditional assertion that the prevalence of pre-hypertension is commonly higher in men than women [5,16,17]. This previous assertion can be reversed if the prevalence is assessed under the pre-hypertensive SBP and DBP levels in both women and men. The overall prevalence of pre-hypertensive levels is significantly higher (low pre-hypertension, 41%, and high pre-hypertension, 59%) than the reported prevalence rates among adult populations in the United States, 36.3% [18]. The prevalence of pre-hypertension in the study sample in Burkina Faso (41% in low pre-hypertension and 59% in high pre-hypertension) is also higher than the prevalence of 40% in Ghana and 58.7% in Nigeria [1,2].

The findings from this study indicated that male and female adults with low household income were more likely to have twice the pre-hypertensive events compared to those who have high household income ($500 to $1,000 per month). Conversely, the finding related to educational levels is not associated with pre-hypertension in adults in Burkina Faso. However, studies reported that a low educational level in adults was positively associated with a pre-hypertensive event [19-21]. The explanation of this discrepancy in education level is explained by the fact that previous studies incorporated a number of no education participants in their studied sample compared to this study. That is probably why no substantial association was found between educational levels and the development of pre-hypertension. Education may relate to better access to good behavior as well as cardiovascular health related information.

Furthermore, being classified as either overweight or obese is a major worldwide risk factor for pre-hypertension [22]. In the current study, the variant BMI (lb/inch^2) explained the variance in the event of pre-hypertension in adulthood. The finding from this study indicated that male and female adults who were overweight and obese were six

times more likely to have a pre-hypertensive occurrence compared with those who were normal and underweight. This study's findings showed that high waist-to-hip ratio in women (≥ 0.85 cm) was a predictor of pre-hypertensive SBP (Wald=4.84, p<0.028) as well as DBP (Wald=4.62, p<0.032) events. This finding is consistent with a research which showed that the risk for pre-hypertensive event was 1.97 times, p=0.01, in Mexican women (WHR>0.80) and men (WHR>0.95) compared to women and men with normal standard [23]. Other study reported that waist-to-hip ratio was significantly higher in the pre-hypertensive group [24]. Being widowed was a predictor for a pre-hypertensive DBP event (Wald=6.18, p<0.013) but not a pre-hypertensive SBP event. The finding demonstrated that females who were widowed are more likely to have a pre-hypertensive

DBP incident (OR=0.330, p<0.013). It seems that women in developing countries, specifically West Africa, are more socio economically dependent on their families [25]. Marriage failure or the loss of partner impose a great period of stress on the widowed, which has been shown to increase the risk of increasing blood pressure [26].

In line with cigarette smoking as a sociocultural factor, current cigarette smoking has been demonstrated to be a relevant predictor of pre-hypertensive SBP (Wald=3.94, p=0.047). Cigarette smoking increases blood pressure and is an exogenous risk factor for pre-hypertension and other cardiovascular diseases. This study concurs with recent studies' findings, which concluded that cigarette smoking damages the arterial wall and increases the BP in adults, resulting in pre-hypertension [27,28]. Other studies found that passive nonsmoking female SBP and DBP were significantly influenced by the carbon monoxide and nicotine from smokers [28,29].

Unlike other studies, alcohol use was not significantly associated with prehypertension in this study. This may be attributed to the religion, cultural, and gender differences in the perception of alcohol. Women may have less alcohol (i.e., drinks) than men in West African socio-cultural context [8].

Moreover, in the current study, moderate physical inactivity contributed to the variance of pre-hypertensive events among adults. The result showed that male and female adults who did not practice moderate physical activity synchronize nearly three times with the pre-hypertensive incident (OR=2.81, 95% CI [1.28; 5.89], p<0.009). Recent studies have found that physical inactivity directly influences the incidence of pre-hypertension [31,33]. This study finding also demonstrated that physical inactivity was higher in suburban adults with pre-hypertension. In general, this finding confirms that physical inactivity in male or female adults contributes to the rise of pre-hypertension.

This study hypothesized that a greater failure of spiritual/religious well-being would be associated with and predicts pre-hypertensive SBP and DBP events. The findings from this study demonstrated that the participants' relationship to God affected pre-hypertension, and the people who failed their relationship with God were seven times more likely to have pre-hypertensive SBP and DBP incidents compared to adults who did not fail in relation with God. Those adults who had failed in their relationship with God may have benefited from the disconnectedness with God, enabling them to transcend the negative stressors associated with the increase of pre-hypertension.

Psychological stress has been theorized as playing a role in raising blood pressure in adults. Perceived stress scale was used to measure the stress level of male and female adults in the last month before the interview in Burkina Faso. The findings demonstrated that stress significantly affected SBP in the sample population, and these findings support the need to implement stress reduction measures to prevent hypertension.

Limitations of the Study

A major limitation of the study was that a convenience sample, a non-probability sampling technique, was used. The convenience sample did not provide a representative sample of the population. To minimize the sample bias and the low external validity of the outcomes, the researcher used Cochran's sample size formula to compute the sample size [34]. The ideal sample should be a large representative sample size, but this was not feasible with limited resources. Furthermore, the sociocultural variables such as the data from dietary patterns used in the analysis might not be accurate because it was self-reported data. Dietary sodium intake data were not encompassed in this study. The findings cannot be generalized and applied at the national level, but they can provide a partial view of the prevalence of pre-hypertension in Burkina Faso, West Africa.

Conclusion

The findings from this study showed that intrapersonal and extrapersonal risk factors are associated with the pre-HTN events in adults in Burkina Faso. The prevalence of pre-HTN level remains evident in the study sample population. Prevalent predictors of pre-HTN SBP and DBP events were identified. The study showed that women participants had higher risk for high pre-hypertension. The roots of this findings are in the specific social and cultural characteristics of the female population of Burkina, where being overweight is interpreted often as a synonymous of spouse's wellness and welfare. Other plausible explanation is the fact that socially and culturally, men are physically active in the workplace than women to meet the needs of their families. And culturally men should not be overweight or obese, the society attributes this phenomenon as a laziness and incapacity to work and sustain family. These cultural and societal factors may contribute to reverse pre-hypertensive event lower trend among men apart from the aged and stressful factors. The study results demonstrated pre-hypertensive SBP and DBP had its links with abdominal adiposity measured by the waist-to-hip ratio. The findings showed that high waist-to-hip ratio in women (≥ 0.85 cm) was a predictor of pre-hypertensive SBP (Wald= 4.84, p<.028) as well as DBP (Wald=4.62, p<.032) events. Women have higher waist-to-hip ratio when compared to men in Burkina Faso, and this risk factor can be connected to life-style factors of women. This finding is supported by other studies [23,24].

In addition to waist-to-hip ratio as a predictor for women, being widowed was a predictor for a pre-hypertensive DBP event. The finding demonstrated that females who were widowed are more likely to have a pre-hypertensive DBP. It seems that women in developing countries, specifically in West African countries, are more socioeconomically dependent on their families. Marriage failure or the loss of partner impose a great period of stress on the widowed, which has been shown to increase the risk of increasing blood pressure. This is supported by similar other studies [25,36].

The study showed that lipid levels did not significantly predict pre-hypertensive event. This can be connected that shea nut, oil, and butter including peanut oil and butter are culturally and widely used as dietary ingredients in the diet of people in Burkina Faso. Research

found that shea nut products can reduce body weight, food intake, and cholesterol [35,36].

There is a need to increase and reinforce awareness on physical activity, spiritual well-being, and stress management in order to maintain a healthy and stable blood pressure for the purpose of reducing future cardiovascular complications. Quasi-experimental design study may need to be conducted among adults with pre-HTN in order to fully provide appropriate pre-HTN management through spiritual/religious well-being, stress and sociocultural factors' management, and eliminate major risk factors.

Potential Conflicts of Interest

For this study, the authors declare no conflict of interest.

Funding

This study research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent

All participants gave their informed consent for inclusion before they participated in the study. The protocol was approved by the Ethics Committee of Ministry of Health/ Regional Department of Health in Burkina (Project identification code: N_2013-000431/MS/RCEN/DRSC) and the Ethics Committee of Institutional Review Board of Azusa Pacific University, California, USA (Project identification code: IRB #73-13).

References

1. Agyemang C, Owusu-Dabo E (2008) Prehypertension in the Ashanti region of Ghana, West Africa: An opportunity for early prevention of clinical hypertension. Public Health 122: 19-24.
2. Isezuo SA, Sabir AA, Ohwovorilole AE, Fasanmade OA (2011) Prevalence, associated factors and relationship between prehypertension and hypertension: A study of two ethnic African populations in Northern Nigeria. J Hum Hypertens 25: 224-230.
3. Lee M, Saver JL, Chang B, Chang KH, Hao Q, et al. (2011) Presence of baseline prehypertension and risk of incident stroke: A meta-analysis. Neurology 77: 1330-1337.
4. Winegarden CR (2005) From "prehypertension" to hypertension? Additional evidence. Ann Epidemiol 15: 720-725.
5. Greenlund KJ, Croft JB, Mensah GA (2004) Prevalence of heart disease and stroke risk factors in persons with prehypertension in the United States, 1999-2000. Arch Intern Med 164: 2113-2118.
6. Liszka HA, Mainous AG 3rd, King DE, Everett CJ, Egan BM (2005) Prehypertension and cardiovascular morbidity. Ann Fam Med 3: 294-299.
7. Qureshi AI, Suri MF, Kirmani JF, Divani AA, Mohammad Y (2005) Is prehypertension a risk factor for cardiovascular diseases? Stroke 36: 1859-1863.
8. World Health Organization (2012) World health statistics 2012.
9. Word Health Organization (2010a) Global health risks: mortality and burden of disease attributable to selected major risks.
10. World Health Organization (2010b) World health statistics 2010.
11. Health-Office-Burkina-Faso [OH-BF] (2009) Annual Statistics 2008. Ouagadougou: Office of Health Burkina Faso.
12. World Health Organization (2013) WHO chronic diseases and health promotion, STEPwise approach to surveillance.
13. Paloutzian RF, Ellison C (1982) Loneliness, spiritual well-being and the quality of life. In: Peplau LA, Perlman D (eds.) Loneliness: A sourcebook of current theory, research and therapy. New York: Wiley.
14. Cohen S, Williamson G (1988) Perceived stress in a probability sample of the United States. In: Spacapan S, Oskamp S (eds.) The social psychology of health: Claremont Symposium on applied social psychology, pp: 31-67.
15. Nie NH, Bent DH, Hull CH (1970) SPSS: Statistical package for the social sciences: McGraw-Hill.
16. Ali A, Meredith TS, John F, Irene B (2013) Prevalence and determinants of pre-hypertension among Omani Adults Attending non-communicable disease screening program in primary care setting in Sohar City. Oman Medical Journal 28: 316–323.
17. Janghorbani M, Amini M, Gouya MM, Delavari A, Alikhani S, et al. (2008) Nationwide survey of prevalence and risk factors of prehypertension and hypertension in Iranian adults. J Hypertens 26: 419-426.
18. Gupta AK, Johnson WD (2010) Prediabetes and prehypertension in disease free obese adults correlate with an exacerbated systemic proinflammatory milieu. J Inflamm (Lond) 7: 36.
19. Erem C, Hacihasanoglu A, Kocak M, Deger O, Topbas M (2009) Prevalence of prehypertension and hypertension and associated risk factors among Turkish adults: Trabzon Hypertension Study. J Public Health (Oxf) 31: 47-58.
20. Royal College of Nursing [RCN] (2011) Spirituality in nursing care: A pocket guide.
21. Sit JW, Sijian L, Wong EM, Yanling Z, Ziping W, et al. (2010) Prevalence and risk factors associated with prehypertension: identification of foci for primary prevention of hypertension. Journal of Cardiovascular Nursing 25: 461-469.
22. Guo X, Zou L, Zhang X, Li J, Zheng L, et al. (2011) Prehypertension: a meta-analysis of the epidemiology, risk factors and predictors of progression. Tex Heart Inst J 38: 643-652.
23. Guzmán-Guzmán IP, Salgado-Goytia L, Muñoz-Valle JF, Salgado-Bernabé AB, Quiroz-Vargas I, et al. (2013) Prehypertension in a Mexican population: influence of age, gender and body fat. Clinical and Experimental Hypertension 35: 67-73.
24. Chaudhry K, Diwan SK, Mahajan SN (2012) Prehypertension in young females, where do they stand? Indian Heart J 64: 280-283.
25. Gilman CP (1998) Women and economics: A study of the economic relation between men and women as a factor in social condition. Small, Maynard & Company.
26. Qureshi GM, Seehar GM, Zardari MK, Pirzado ZA, Abbasi SA (2009) Study of blood lipids, cortisol and haemodynamic variations under stress in male adults. J Ayub Med Coll Abbottabad 21: 158-161.
27. Leone A (2012) How and why chemicals from tobacco smoke can induce a rise in blood pressure. World J Pharmacol 9: 10-20.
28. Yarlioglues M, Kaya MG, Ardic I, Calapkorur B, Dogdu O, et al. (2010) Acute effects of passive smoking on blood pressure and heart rate in healthy females. Blood Press Monit 15: 251-256.
29. Flouris AD, Metsios GS, Jamurtas AZ, Koutedakis Y (2010) Cardiorespiratory and immune response to physical activity following exposure to a typical smoking environment. Heart 96: 860-864.
30. World Health Organization (2004) Global status report: Alcohol policy.
31. Ferguson TS, Younger NO, Tulloch-Reid MK, Wright MBL, Ward EM, et al. (2008) Prevalence of prehypertension and its relationship to risk factors for cardiovascular disease in Jamaica: Analysis from a cross-sectional survey. BMC Cardiovascular Disorders 8: 10-15.

32. James J, Soyibo A, Hurlock L, Gordon-Strachan G, Barton E (2012) Cardiovascular risk factors in an eastern Caribbean Island: Prevalence of non-communicable chronic diseases and associated lifestyle risk factors for cardiovascular morbidity and mortality in the British Virgin Islands. West Indian Medical Journal 61: 429-436.

33. Koura M, Al-Dabal B, Rasheed P, Al-Sowielem L, Makki S (2012) Prehypertension among young adult females in Dammam, Saudi Arabia/ Préhypertension chez des jeunes femmes à Dammam (Arabie saoudite). Eastern Mediterranean Health Journal 18: 728-732.

34. Cochran WG (2007) Sampling techniques: John Wiley & Sons.

35. Carthew P, Baldrick P, Hepburn PA (2001) An assessment of the carcinogenic potential of shea oleine in the rat. Food Chem Toxicol 39: 807-815.

36. Israel MO (2014) Effects of topical and dietary use of shea butter on animals. American Journal of Life Sciences 2: 303-307.