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Relationship of Educational and Civil Status with Blood Pressure, Blood Sugar and Atherogenic Index in a Rural Area: A Cross-Sectional Population Study

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Abstract

Background: *Educational and civil states affect CVD. It is not known how much this applies to our environment. We therefore sought to determine the relationship between these socio-economic variables and CVD in our environment to enable us recommend manipulations that can enhance cardiovascular health status.*

Methods: *This was a cross-sectional population survey of CVD in a rural community in North-Central Nigeria in 2008. Subjects as part of history gave their educational and civil status. They were examined physically and blood taken in a randomly selected subset for relevant biochemical tests.*

Results: *840 subjects were studied; 27.5% were males, 77.8% married 14.1% widowed, 7.2% single and 0.8% divorced. Primary education was highest at 52.7%, secondary 34.8% and tertiary 12.5%. The rest had no formal education. Educational status did not influence BMI, SBP, DBP, AI and blood sugar significantly. SBP and DBP differed significantly according to civil status (p=0.000). On multiple comparison, it turned out that the widows fared the worst. Physical inactivity at work and leisure were implicated the most resulting in their having the highest BMIs*

Conclusion: *Higher education without rise in socio-economic status does not increase CVD morbidity; and widows largely for physical inactivity have higher CVD risks. It istherefore important to discourage all cultural rites that encourage widows to be sedentary; and counsel them against undue grief and depression that tend to bolster physically inactive life-styles.*

Keywords: *Socioeconomic status, Cardiovascular disease, Rural, Nigeria*

Introduction

Educational level attained has been shown in previous studies to impact on certain cardiovascular risk factors. [1]It is a measure of socio-economic status, which is a known risk factor for cardiovascular disease (CVD). [2]It either puts the individual in a position of knowledge to understand and take steps to prevent the disease. On the contrary,life style related to such status puts him at risk. [3]In the same vein, civil status whether married or never married has been found to impact on CVD burden;[4] more for men than women. [5]. Widowhood, a civil status removes the protective effects of marriage. [6].In populations where these stand true, it is possible to reduce overall CVD burden by working on the mediating bio-behavioural factors through which they influence CVD. Publications in our environment on this subject are scarce and may actually not exist. We therefore used data generated by our team on CVD risk factors in a rural North-Central Nigerian Community to explore any relationship between educational and civil status with major CVD risk factors. Any significant association would, it was

thought, become available for clinical epidemiologists to manipulate in CVD prevention strategies.

Materials and Methods

The methods of data generation in the main study have been published elsewhere. [7]Briefly we re-surveyed after 17 years, this rural area that had been surveyed first in 1991 as part of the National Non-Communicable Diseases Survey by the Federal Ministry of Health of Nigeria. After ethical clearance (Research Ethics Committee, Jos University Teaching Hospital) and appropriate clearance from the administrative hierarchy of the area, we set out to work. On each of the days people (15 years and older) were registered as they arrived and had personal, social and medical histories recorded before blood collection (randomized 1 out of 3 in order of arrival and registration) for biochemical tests. Every subject had a physical examination, which included blood pressure measurement by standard sphygmomanometry.

At the end, data were analysed in the computer center of University of Jos using SPSS version 17. Data were subjected to analysis of variance (ANOVA) as well as post-hoc multiple comparison. Statistical significance was set at $p<0.05$

Results

A total of 840 subjects were studied, 27.5% of whom were males. Their ages ranged from16 to 104 years with a mean of 45.5 $\pm$18.2 years. Majority, 75.8% lived most of their last 5 years in this rural area and 19.3% though resident at the material time in this rural area lived most of their last 5 years in the urban areas. Only few smoked (1.8%) andequally not many (4.1%) were partial to ethanol. For civil status, 645 (77.8%) were married, 117 (14.1%) widowed and 60 (7.2%) were single and 7(08%) divorced. The short fall of 11 arose from those who did not have information on civil status in their forms. For educational attainment, 177(52.7%) had primary education as the highest, followed by 117 (34.8%) for secondary and 42 (12.5%) for tertiary. The rest 504 did not attend any formal education. This segment was not further analysed asit could be anything between Arabic and non-formal western education.

When subjected to ANOVA there was no difference between groups under educational attainment for body mass index (BMI), systolic blood pressure (SBP), diastolic blood pressure (DBP), blood sugar (BS) and atherogenic index (AI). See Table 1.

Table1. *Educational Status Vs BMI, SBP, DBP, BS and AI*

		Sum of squares	df	Mean square	F	p
BMI	Between gp	92.838	2	46.419	2.543	0.08
	Within gp	6059.393	332	18.251		
	Total	6152.231	334			
SBP	Between gp	668.205	2	334.103	0.763	0.467
	Within gp	145719.783	333	437.597		
	Total	146387.988	335			
DBP	Between gp	135.99	2	67.995	0.528	0.59
	Within gp	42861.998	333	128.715		
	Total	42997.988	335			
BS	Between gp	1.784	2	0.892	1.125	0.329
	Within gp	76.891	97	0.793		
	Total	78.675	99			
AI	Between gp	2.557	2	1.279	0.898	0.441
	Within gp	136.63	96	1.423		
	Total	139.187	98			

For civil status there was between groups significance for SBP (p=000) and DBP (p=0.005) only. See Table 2.

Table2. *Civil Status Vs BMI, SBP, DBP, BS and AI*

		Sum of squares	df	Mean square	F	p
BMI	Between gp	107.469	3	35.823	1.79	0.14
	Within gp	16469.1	823	20.001		
	Total	16576.5	826			
SBP	Between gp	27263.8	3	9087.949	13.111	
0.000						
	Within gp	571835	825	693.134		
	Total	599099	828			
DBP	Between gp	2048.02	3	682.672	4.372	
0.005						
	Within gp	128824	825	156.15		
	Total	130872	828			
BS	Between gp	1.007	3	0.336	0.316	
0.814						
	Within gp	270.931	255	1.062		
	Total	271.938	258			
AI	Between gp	4.166	3	1.389	0.874	
0.455						
	Within gp	403.547	254	1,589		
	Total	407.713	257			

With multiple comparison, there was significant difference between single and widowed subjects for BMI in favour of the latter. The other details are shown in Table 3 with most of the differences coming under SBP and DBP.

Table3. *BMI, SBP and DBP data of subjects*

	BMI	P	SBP	P	DBP	P
M/S	1.05	0.085	9.77	0.006*	4.17	0.014*
M/W	-0.42	0.35	-13.27	0.000*	-2.47	0.049*
M/D	1.79	0.292	16.08	0.108	6.42	0.177
S/W	-1.47	0.04*	-23.04	0.000*	-6.64	0.001
S/D	0.74	0.679	6.31	0.548	2.25	0.653
W/D	2.21	0.204	29.36	0.004*	8.89	0.068

Data represent mean difference between civil status

Key: M – Married, S – Single, W – Widowed, D- Divorced, * - statistically significant difference.

To further see what factors may be responsible for these differences, we subjected data on civil status to comparison with lifestyles namely cigarette smoking, alcohol use, physical inactivity and dietary salt preference. There was no difference in proportion of smokers and alcohol users in the different marital status groupings. However, for physical activity in regular occupation, there was significant difference across groups (x^2 = 54.49; p = 0.000) with married people most active, followed by the singles and widowed and the divorced the least active. For leisure time physical activity there was also significance across groups (x^2 = 39.46; p = 0.000) with the singles taking the lead, followed by the married group and the widowed. For salt preference, there was across group difference (x^2 = 8.84; p = 0.031). Married people used salt the most; single and divorced followed at the same level and the widowed the least.

Discussion

This study has shown that educational status had no significant impact on BMI, SBP, DBP, blood sugar and AI. This contrasts with previous findings[8,9] where there was an inverse relationship between blood pressure and blood sugar with educational status, thought to be linked with socio-economic deprivation early in life among the lowly educated. The impaired growth consequent upon this predisposes to hypertension and diabetes.[10]Some others have predicated this high burden in the lowly educated, to a greater likelihood to smoke, eat unhealthy diet and reduced tendency to exercise. [2,11]In a Vietnamese study,[12] the inverse relationship was recorded only with hypertension and not diabetes. In the work referred to above, BMI, blood pressure and diabetes rose as the educational statusfell. BMI is high in hyperinsulinaemic or insulin – resistant states; becoming manifest with hypertension and diabetes. With BMI not having any significant relationship with educational status in the present study, it becomes clear why educational status had no significant relationship with blood pressure indices and sugar. BMI has been shown to be a modifiable bio-behavioural risk factor through which educational attainment impacts blood pressure.[13]With pervasive unemployment in Nigeria, it does appear that higher educational attainment does not necessarily translate to improvement in economic status. Improvement in economic status comes with dietary and lifestyles changes that may act either way. On the one hand it may fuel obesity, hypertension, diabetes mellitus and dyslipidaemia if it goes with physical inactivity, stress and harmful dietary indulgences.[14]On the other hand, it may result in a favourable cardiovascular status if it leads to affordability of healthy diet and lifestyles. Therefore,given that they live in the same socioeconomically deprived background, and attained education not translating to improve economic status (occasioned by pervasive unemployment) educational attainment does not affect blood pressure in this population. It must be stated that socio-economic status is a complex phenomenon influenced by such variables as education, occupation and finance. [15] For us at this time, high educational attainment does not necessarily translate to gainful employment the result of which is poor finance. That explains the seeming paradox in this study where high educational attainment did not result in high BMI, hypertension and other cardiovascular disease risk factors. Curiously, this may be an African phenomenon as a study in Ethiopia showed that low income status was associated with reduced odds for hypertension. [16]

Civil status however showed a significant variation between groups with SBP and DBP only. It had no relationship with BMI, blood sugar and atherogenic index. This is also the experience form two Ghanaian studied reporting higher rates of hypertension among the married, especially women. [17,18]The widows in our study had the greatest burden with the highest mean values comparedto the other civil states. The burden was less for the married, singles and divorced in that order. The finding here conforms with what is known that the widow civil state is heavily burdened with CVD.[19]Widowhood is top among the list of stressful life events.[20] with acute and chronic stress resulting from deterioration in economic status and disruption of networks providing psychological support. [21]Irrespective of the coping mechanisms available to the individual, death of a significant other like the spouse leads to stress hormonal response. [22]Stress produces and worsens cardiovascular health by provoking release of pituitary and adrenal hormones which alter cardiovascular function. [23.]It

also produces pro- inflammatory cytokines associated with a variety of CVD, as well as leading to a string of unhealthy behaviours as a form of coping (smoking, alcohol abuse, over eating, sedentary living) which increase risk of CVD. [24]When subjected to post-hoc multiple comparison to see what lifestyle issues may be at play, the widows were significantly low on the physical activity (in regular occupation and leisure time) levels. Physical inactivity has been shown to contribute to CVD. [25]Widowhood is associated with depression which may manifest with physical inactivity. In cultural milieus such as ours, they are expected to remain confined for a prescribed period; mourning their spouses and hardly engaging in any activity. That may well be their modifiable mediating bio-behavioural risk factor for hypertension, as other risky life styles studied (namely: cigarette smoking, alcohol use and salt preference) did not attain statistical significance .

Our study is limited by the fact of the relatively small population size and the fact that it was conducted only in one site and does not involve urban residents. It also used only educational attainment to define social status. In conclusion, we found that in this rural population, the known gradient of CVD risk factors with educational status did not operate. It emphasises the position of Ebrahim [26]calling for global benefits in repeating studies of established risk factors in low and middle income countries for the reasons that variations exist in exposure levels and confounders of risk factor – non communicable disease association. Here educational status without corresponding improvement in socio-economic status, does not carry any added risk for CVD; and shows that educational attainment and income capture different aspects of socio-economic status. [27] Whereas educational attainment is known to empower the individual to make informed decisions,[28]income generating employment is important if the individual is to take all opportunities that his education would present him. Otherwise, he remains encumbered by the cumulative effect of a lifetime of deprivation and want. Also the widows largely for physical inactivity have higher CVD risks, presenting a platform for modulation if their CVD morbi-mortality isto be favourably ameliorated.

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