Self-reported hypertension in eMbalenhle, Mpumalanga, South Africa: findings from a vulnerability to air pollution assessment

M Matooane, R Oosthuizen, J John

Mamopeli Matooane, Riëtha Oosthuizen, Juanette John, Natural Resources and the Environment, Council for Scientific and Industrial Research.
E-mail: mmatooane@csir.co.za

The study determined the prevalence of self-reported hypertension and evaluated the relationship between self-reported hypertension and associated risk factors among adults who participated in the 2006 vulnerability to air pollution study in eMbalenhle, Mpumalanga, South Africa. Face-to-face interviews were conducted in September 2006 with the heads of 377 randomly selected households to obtain information on the household status of health and disease risk factors. eMbalenhle data were compared to the published provincial data on variables of interest. Logistic regression analysis was employed to determine associations between self-reported hypertension and individual risk factors. The prevalence of self-reported hypertension (7.0%), arthritis (3.9%), diabetes (3.8%) and asthma (2.2%) were comparable to provincial self-reported disease figures of 9.0%, 3.5%, 2.3% and 3.4%, respectively. self reporting of hypertension increased significantly with age (OR: 1.07; 95% CI: 1.05-1.09; $p<0.001$), being female (OR: 3.35; 95% CI: 1.84-6.01; $p<0.001$), and having doctor-diagnosed arthritis (OR: 2.42; 95% CI: 1.12-5.23; $p<0.01$) and diabetes (OR: 6.00, 95% CI: 2.08-17.26; $p<0.01$). The study demonstrates that self-reported hypertension and other chronic diseases in eMbalenhle mirrored the general provincial chronic diseases' patterns despite the poor socio-economic status of this community relative to the province. Self-reported hypertension was strongly related to age, gender, and self-reported arthritis and diabetes

Introduction

Hypertension is a major risk factor for cardiovascular disease[1,2] and stroke.[2] It is also associated with chronic health conditions including rheumatoid arthritis, diabetes, depression and asthma.[3-7] In addition, several factors including old age, being female, smoking, alcohol consumption, stress, race and lower levels of education attainment are known correlates of hypertension.[8-13]

Approximately 20% of the South African population are affected by hypertension[11] with varying levels among different population groups. For example, the South African Demographics and Health Survey (SADHS) of 2003 suggests that the highest and lowest levels of self-reported hypertension, a form of assessment used in large surveys when other measurements are not available,[14] are found in the coloured (24.0%) and the white (9.9%) population groups, respectively. The prevalence also varies by location with the lowest levels in rural areas, particularly in the African population.[12,15] However, African women, who tend to be overweight,[16] had the highest levels of hypertension as compared to women of other population groups.[17] When considering measured hypertension (≥140/90 mmHg), Africans have the lowest prevalence (22.1%) when compared to coloured (27.9%), Indian (24.4%) and white (32.9%) population groups and this pattern transcends gender differences.[18]

Since the advent of democracy in 1994, the social fabric of South Africa has changed, with most African South Africans migrating from rural areas into cities in search of a better life.[19] This has resulted in a situation which potentially predisposes them to the risk of lifestyle diseases such as hypertension.[13] The reasons concerning this issue have, however, not been clearly deciphered, particularly in the case of urban Africans who, due to various challenges, find themselves living in socio-economically deprived communities.[13] These communities are often characterised by high levels of alcohol consumption, reduced physical exertion, and increased autonomic activity.[16]

Such is the case of eMbalenhle, a low socio-economic community located at 26.5333° S (latitude) and 29.0667° E (longitude) and at an elevation of 1,585 m above sea level in Mpumalanga, South Africa. eMbalenhle has a population of approximately 141,741[20] which constitutes 5% of the provincial population (SSA, 2003). It is characterised largely by informal housing structures commonly known as shacks (63.0%). There is an adequate coverage of other basic social services including piped water inside the dwelling (90.0%), access to sewage disposal facilities such as flush toilets (77%), and solid waste disposal services (78%).[21]

Against this background, it is important to understand how the prevalence of chronic diseases in poor urban communities compares to the provincial level and how these might be influenced by other existing diseases. This paper therefore reports on the prevalence of self-reported hypertension and other chronic health outcomes in eMbalenhle, compares these prevalence rates to provincial figures, and assesses

the association between self-reported hypertension and chronic diseases as well as socio-economic factors.

Materials and methods

Data collection

Data collection procedures have been described elsewhere (John *et al.*, 2008). In brief, a questionnaire was administered by trained field workers and completed by a random sample of 377 households in eMbalenhle after ethical approval was obtained from the University of Pretoria Human Ethics Committee. A household caregiver who acted in proxy provided answers to questions pertaining to the household demographics, general living conditions, risk factors for disease and household chronic health status.

Data analysis

STATA Release 10 (StataCorp LP) was used for the statistical analysis. Analyses entailed descriptive statistics including frequency distributions and percentages for variables of interest. These were compared with provincial values obtained from the SADHS of 2003. Associations between categorical variables were tested by means of contingency tables and the chi square (X^2) test. Multiple logistic regression models, using odds ratios at the 95% significance level, were used to determine associations between self-reported hypertension and individual level independent variables.

Dependant variable

Self-reported hypertension was assessed by asking the respondent the following question: 'Have you ever been told by a doctor that you had high blood pressure?' The response was coded yes or no.

Independent variables

Individual level characteristics were age, gender, education status, employment status and chronic disease status of concern for this study, namely self-reported hypertension, arthritis, diabetes, asthma and depression. Age was treated as a continuous variable in the models. Education attainment categories included 'no education', 'primary school' and '≥high school'. Chronic conditions were assessed by asking respondents whether a doctor has ever told them that they had any of the chronic conditions mentioned above.

Three models were developed. The first model comprised self-reported hypertension, age and gender. Model 2 comprised and model 1 independent variables, as well as education and employment status. Model 3 comprised model 1 and

Table I: Descriptive statistics for individual characteristics

Characteristic	Description	18-34 yrs n (%)	35-44 yrs n (%)	45-54 yrs n (%)	55-64 yrs n (%)	65+ yrs n (%)
Gender	Male	216 (53.3)	94 (23.2)	52 (12.8)	26 (6.4)	17 (4.2)
	Female	274 (57.4)	106 22.2)	48 (10.1)	27 (5.7)	22 (4.6)
Education	No schooling	8 (6.6)	27 (22.3)	29 (24.0)	32 (26.4)	25 (20.7)
	Primary	91 (32.2)	88 (31.1)	55 (19.4)	27 (9.5)	22 (7.8)
	≥ High school	414 (77.5)	88 (16.5)	20 (3.7)	5 (0.9)	7 (1.3)
Employment	No	335 (72.0)	83 17.8)	30 (6.5)	11 (2.4)	6 (1.3)
	Yes	173 (38.4)	123 (27.3)	79 (17.6)	42 (9.3)	33 (7.3)
Asthma	No	509 (56.6)	201 (22.3)	103 (11.4)	49 (5.4)	38 (4.2)
	Yes	5 (22.7)	6 (27.3)	6 (27.3)	4 (18.2)	1 (4.5)
Arthritis	No	508 (58.7)	187 (21.6)	100 (11.6)	38 (4.4)	32 (3.7)
	Yes	6 (10.5)	20 (35.1)	9(15.8)	15 (26.3)	7 (12.3)
Diabetes	No	513 (57.1)	201 (22.4)	100 (11.1)	46 (5.1)	38 (4.2)
	Yes	1 (4.2)	6 (25.0)	9 (37.5)	7 (29.2)	1 (4.2)

2 variables, as well as chronic conditions, namely asthma, diabetes, depression, and arthritis.

Results

Socio-demographic profile

Table I provides the socio-demographic characteristics for the study population. There were more females (54.1%) than males (45.9%). The age distribution was biased towards the 18-34 year (57%) age group. Approximately 13.0%, 28.0% and 59.0% of the adults had no schooling, primary and high school or more level of education, respectively. Although the employment rate in the economically active age group (18-64 years) was 49.2%, most of the occupations were largely elementary in nature. Income generation for the households was largely confined to salaried full-time employment (18.6%), part-time employment (11.5%) and pension grants (2.3%).

Self-reported hypertension

Overall, the prevalence of self-reported hypertension was 7% with statistically significant differences in gender, age, education, employment, and chronic conditions (Table II). Women and the elderly were more likely to report hypertension than their male and younger counterparts. The employed and those with low levels of education were also more likely to report hypertension than their unemployed and more educated counterparts, respectively. Other conditions which are usually associated with hypertension such as arthritis, diabetes and asthma had low prevalence rates of 4%, 4% and 2.4%, respectively.

Comparison of the chronic health conditions in eMbalenhle and Mpumalanga

Table III presents the comparison of the prevalence of self-reported health in eMbalenhle and Mpumalanga based on

Table II: Comparison of self-reported hypertension with individual characteristics

Characteristic	Description	Yes	No	p-value
Gender	Male	24	381	<0.001
	Female	76	401	
Age	18-34	13	501	
	35-44	32	176	
	45-54	27	82	<0.001
	55-64	21	32	
	≥65	11	28	
Education	No schooling	39	82	
	Primary	39	216	<0.001
	≥ High school	19	515	
Employment	No	38	427	0.004
	Yes	64	386	
Arthritis	No	77	788	<0.001
	Yes	26	31	
Asthma	No	97	803	0.015
	Yes	6	16	
Diabetes	No	88	810	<0.001
	Yes	15	9	

the 2003 SADHS. Overall, the prevalence of chronic diseases was higher in females relative to their male counterparts. The prevalence of self-reported hypertension in eMbalenhle and Mpumalanga was almost identical for females although their self-reported diabetes and arthritis were higher by 47.6% and 122.5%, respectively, in eMbalenhle relative to Mpumalanga. However, the proportion of females reporting asthma in eMbalenhle was lower by approximately 26.9% compared to Mpumalanga. More males (64.5%) reported hypertension in eMbalenhle compared to provincial estimates. The proportion of males in eMbalenhle reporting asthma, arthritis and diabetes were lower by approximately 23.1%, 23.3%, and 36.0%, respectively, compared to male-reported values of these conditions at provincial level.

Table III: Comparison of chronic diseases in eMbalenhle with provincial figures (≥15 years)

Health condition	eMbalenhle (%)			Mpumalanga (%)		
	Male	Female	Total	Male	Female	Total
Self-reported hypertension	5.4	14.6	10.0	3.1	14.9	9.0
Asthma	2.0	1.9	2.0	2.6	4.2	3.4
Arthritis	2.3	8.9	5.6	3.0	4.0	3.5
Diabetes	1.6	3.1	2.4	2.5	2.1	2.3

Multiple logistic regression analysis

Table IV provides the results of the multiple logistic regression modelling. The probability of self-reported hypertension showed a statistically significant increase with increasing age, being female, and having been diagnosed with diabetes

and arthritis. These observations remained significant even after adjusting the models for the individual characteristics

Table IV: Self-reported hypertension and associated risk factors

Characteristic	Description	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Gender	Male	1	1	1
	Female	3.61[c] (2.12 – 6.15)	3.60[c] (2.03 – 6.40)	3.35[c] (1.84 – 6.01)
Age		1.10[c] (1.08 – 1.11)	1.09[c] (1.07 – 1.11)	1.07[c] (1.05 – 1.09)
Education	No schooling	1	1	1
	Primary		1.18 (0.63 – 2.23)	1.13 (0.59 – 2.18)
	≥ High school		0.65 (0.31 – 1.38)	0.63 (0.30 – 1.36)
Employment	No		1	1
	Yes		1.06 (0.59 – 1.89)	1.39 (0.74 – 2.61)
Asthma	No			1
	Yes			2.12 (0.64 – 6.91)
Diabetes	No			1
	Yes			6.00[b] (2.08 – 17.26)
Arthritis	No			1
	Yes			2.42[a] (1.12 – 5.23)

a = 0.05; b = 0.01; c = 0.001

of age and gender. Education and employment status did not have a statistically significant effect on the probability of self-reported hypertension.

Discussion

The results of the study indicated that the age profile of the adult population followed the general provincial patterns and was biased towards the 18-34 year old age group. The gender profile was almost identical to that of the provincial population.[22,23] The employment rate in the economically active age group (15-64 years) was approximately 45.5%, suggesting higher levels of unemployment compared to the provincial estimate of 26.6%.[23] However, those with a high school level qualification or more were more likely to be employed, corroborating evidence that higher levels of education improve job prospects.[24] It was not possible to assess the relationship between employment and earnings due to poor data capture concerning income.

Overall, self-reporting of chronic diseases followed the general patterns of self-reported chronic diseases in South Africa, with females reporting higher levels of chronic diseases relative to their male counterparts. This observation conforms to findings from other studies that indicate that women tend to have a higher utilisation rate of healthcare services than their male counterparts, and as a result they are likely to have higher

rates of self-reported chronic health issues.[25] While the prevalence of self-reported hypertension was almost identical for females in eMbalenhle and the province, the prevalence for males was slightly higher than the provincial values. self-reported hypertension prevalence for both males and females in eMbalenhle was lower than that of the national African South African population of 6.9% and 18.9% for males and females, respectively.[9] eMbalenhle self-reported hypertension prevalence was also found lower than that reported for some rural African (KwaZulu-Natal) populations, which has seen an increase from ~10% in the early 1980s[26,27] to the latest estimate of 24%,[28] a situation suggestive of a worsening morbidity pattern likely to be influenced by among others the high prevalence of obesity[28,33] and HIV.[29,30] Migration of rural populations into cities across the country and the attendant adoption of westernised diet and other lifestyle factors,[33] may also lead to heightened hypertension that is likely to influence the increasing cardiovascular disease risk evident in the urban African population.[31] Of the respondents who reported hypertension, 16.5% reported having been diagnosed with diabetes, 27% with arthritis and 3% with depression. These are chronic diseases that are often associated with high blood pressure.[3,4,7]

The prevalence of self-reported diabetes in eMbalenhle mirrors that of the province and of urban African South Africans, which is the lowest relative to other population groups (i.e. coloured, white, Indian).[32] Women were almost twice more likely to report diabetes than their male counterparts. Our findings therefore suggest that there are no major differences between self-reported diabetes in eMbalenhle and the province despite potential disparities in socio-economic status, diet, obesity, and exercise levels, all known determinant factors for diabetes.[33,34]

The prevalence of self-reported arthritis was also the highest for females (8.9%) in eMbalenhle relative to their male (2.3%) counterparts, the provincial female prevalence (4.0%) and the national African female (7.5%) prevalence.[9] The male prevalence for self reported arthritis was, however, lower than the provincial estimate (3.0%) and the national African male estimate of 4.3%.[9]

The prevalence of self-reported chronic asthma, which was almost identical between males and females in eMbalenhle, was lower overall than both the provincial estimates and the national African estimates of 2.5% and 3.8% for males and females, respectively.[9]

The study shows that the probability of self-reported hypertension varied significantly by age and gender as well as self-reported chronic diseases. The relatively high prevalence (38%) of self-reported hypertension in those above 54 years is also consistent with other studies.[25] The probability of self-reported hypertension increased significantly with being female, and in those who reported having been diagnosed with arthritis and diabetes, but not asthma. Education and employment status, while having a

positive effect on self-reported hypertension, did not have a statistically significant effect, even after adjusting for age and gender. This result is also consistent with other studies which indicate that socio-economic standing does not modify the degree of self-reporting of hypertension.[14,25]

While this study was designed to obtain information on air pollution-related vulnerability factors in a low income community rather than determining associations between self-reported hypertension and other risk factors, it does indicate that the research questions were adequate to address other health issues given the similar prevalence rates obtained relative to the 2003 SADHS. In addition, the study indicates that reliance on the head of the household or caregiver for information on individual health status of the household members is adequate. It should, however, be noted that prevalence rates for self-reported hypertension were often lower than prevalence rates for physically measured hypertension, due to various reasons including respondents self-reporting hypertension when in actual fact they may have normal blood pressure or vice versa.[35,36] As a result, self-reported hypertension studies may be prone to hypertension misclassification,[37] a limitation that can be overcome by combining selfreporting of health status with a medical diagnosis. In addition, as the survey was not purposefully designed to evaluate self-reported hypertension, some of the important risk factors such as obesity, malnutrition and stress[18] were not included in the assessment; as a result, the results need to be treated with caution.

Conclusions and recommendations

The results of the study reflect that the prevalence of self-reported hypertension and other chronic conditions in this low socio-economic community is similar to provincial estimates for self- reported chronic health outcomes. While those with chronic diseases had a higher probability of self-reported hypertension, the socio-economic factors education and employment status were not significant drivers for self-reported hypertension. In order to improve our understanding of chronic disease in this community, contextual environmental effects on chronic diseases in this community are needed.

Acknowledgements

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