ORIGINAL ARTICLE

Correlation Between Hypertension and Income Distribution Among United Arab Emirates Population

S Sabri, PhD*, A Bener, PhD, V Eapen, FRCPsych*, A A Azhar, FRCS***, A Abdishakure, PhD*, J Singh PhD *****

*Department of Psychiatry, and Internal Medicine, Faculty of Medicine & Health Science, UAE University, PO Box 17666, Al-Ain, United Arab Emirates, **Department of Medical Statistics & Epidemiology, ***Accident Emergency Department, Hamad General Hospital & Hamad Medical Corporation, University of Qatar, Doha, State of Qatar, ****Department of Biological Sciences, University of Central Lancashire, UK

Summary

To determine the correlation between hypertension and income distribution among United Arab Emirates (UAE) population. Case-control study matched for age, sex, nationality and education. The survey included 500 hypertensive adults aged 20-65 years ascertained from Primay Health Care (PHC) Clinics along with a randomly selected sample of 500 control subjects from the community. Face-to-face interviews were done where data were gathered on socio-demographic-economic status (SES) and lifestyle habits. Hypertension was defined according to WHO criteria as having Systolic Blood Pressure (SBP) $\geq$ 140 mm Hg and/or Diastolic Blood Pressure (DBP) $\geq$ 90 mm Hg and/or being on antihypertensive treatment. The survey was carried out in urban and semi-urban PHC Clinics. A total of 818 subjects were included in this study from a sample of 1000; 409 cases and 409 controls. There were 422 males and 396 females in this study, with 255 UAE nationals and 438 expatriates. Hypertension was found to be significantly higher among the low income group (35.2% vs. 24.9% controls, p=0.002; while mean SBP in the low income group was 130.2±17.6 vs. 128.0±17.4 controls, p=0.022). Among males, smoking and alcohol consumption were higher among the group with low income level but only smoking showed significant difference (p value=0.016). Activity level was higher among the low income groups. This study supports the importance of socio-economic factors as an income distribution effect on life-style habits and hypertension.

Key Words: Hypertension, Epidemiology, Prevalence, Case-Control study, Socio-economic, Life-style, Risk factors, UAE

Introduction

Cardiovascular diseases are a major cause of deaths in most of industrialized countries as well as developing countries[1]. Although several major risk factors for coronary heart disease have been identified, researchers are still exploring the role of several other modifiable risk factors for cardiovascular diseases. A mounting body of evidence indicates that socioeconomic status, behavioral, psychosocial, and environmental factors are the major determinants of health and life expectancy in most communities[2]. In this context, several investigators have demonstrated an inverse association between the overall morbidity and mortality and socioeconomic status as well as independent inverse association between CVD morbidity and mortality and socioeconomic status[3]. Even though hypertension is one of the main risk

This article was accepted: 10 March 2005

Corresponding Author: A A Azhar, Accident and Emergency Department, Hamad General Hospital, PO Box 3050, Doha, State of Qatar

factors for cardiovascular disease, a review of the literature indicates that only few studies have examined the association between the incidence of hypertension and the income as well as other indicators of socioeconomic status (SES)[4,5]. There have been few empirical attempts to explore behavioral and biologic pathways by which SES and mortality are linked. But the underlying biologic pathways by which socioeconomic conditions can promote a disease are not clearly understood.

Social support appears to influence negative health behaviors such as smoking, heavy alcohol consumption, poor dietary habits, sedentary lifestyle and sub-optimal health service utilization[6]. Social support may also buffer against stress and thereby reduce activation of the neuroendocrine system, leading to diminished progression of high blood pressure and other complications[7]. More recent studies reported that socio-economic status has an effect on hypertension (Sabri et al, 2004). Several studies have found that socioeconomic and psychosocial factors strongly affect health, thus making income distribution a good measure to use in the beginning to examine the variables that affect the health of the population[8, 9,10].

The aim of this study was to determine the correlation between hypertension and income distribution among United Arab Emirates population.

Materials and Methods

Study Design

This study followed a matched case-control study design to determine the relationship between hypertension and socioeconomic status (SES), age, sex, nationality, educational level, occupation, cigarette smoking habit, physical activity, lifestyle habits and body mass index. This study was part of a larger scale investigation carried out in the district of Al Ain in the United Arab Emirates during the period of October 2001 to July 2002.

Questionnaire

The questionnaire and criteria for the hypertension were designed to meet the objective of this study. A translated Arabic version of the questionnaire was revised by the physician (MSOAZ) [bilingual] and back translated by a bilingual co-investigator, unacquainted with the original English version. Both translators have met and made the necessary corrections, modifications and rewording after considering the minor differences and discrepancies, which were identified. A pilot study carried out as a part of the process of validation and feedback was requested from the first twenty patients regarding the clarity and appropriateness of the questions. These subjects were asked to complete a form designed specifically to express their opinion on the questionnaire. Minor changes were made in the questionnaire taking into account their feedback.

Sampling Procedure

A multi-stage stratified cluster sampling design was developed using the administrative divisions of the Al Ain Medical Health District which had approximately equal numbers of inhabitants. In order to secure a representative sample of the study population, sampling was stratified with proportional allocation according to stratum size from urban and semi-urban areas. The sample size was determined on the priori presumption that the prevalence rate of hypertension in the UAE would be more or less similar to the 20% rate observed in the pilot study. Assuming the prevalence of hypertension to be 20% and allowing for an error of 5% (Type-1 error at a 1% level of significance), a sample size of 500 cases and 500 matched controls was estimated. There were a total of 22 PHC Clinics available, of which 8 were selected randomly. Of the 8 PHC Clinics, 5 were selected from urban and 3 from the semi-urban areas of the Al-Ain Medical Health District. Patients were classified as hypertensives or controls based on the information from health care clinic documentations.

Selection of Hypertensive Subjects

Individuals were classified as hypertensive if their self-reported results of systolic blood pressure were more than 139 mmHg or diastolic blood pressure more than 89 mmHg and/or if they were currently taking antihypertensive medication[11]. Consecutive cases of 500 hypertensive patients aged 20-65 years were selected by a simple random process from the PHC clinics.

Selection of Community Controls

Control subjects aged 20-65 years were identified from the community with their self-reported results of systolic blood pressure less than 140mmHg and diastolic blood pressure less than 90 mmHg, and if they were not on any antihypertensive medication. This community survey involved a random sample of 500 subjects in the community.

Data Collection and interview

The case—control ratio was 1:1 and there were equal numbers of men and women in the study, which is in

accordance with their ratio in the general population. The survey was based on standardized interviews performed by trained health professionals and nurses. Informed consent was obtained from each person who agreed to enter the study. Participants were interviewed by health professionals and nurses concerning information about age, nationality, educational level, occupation, residential area (urban and semi-urban), cigarette smoking habits, physical activity, lifestyle habits, body mass index, previous history of hypertension, diabetes and complaints of cardiovascular diseases, and current use of medication for hypertension and diabetes. For both patients and controls, smoking behaviour was classified as a current smoker, ex-smoker or non-smoker. A current smoker was defined as a person who regularly smoked at least one cigarette per day, an ex-smoker was someone who had given up smoking for at least 6 months and non-smoker was a person who had never smoked regularly. No data were obtained on alcohol consumption since this is conservative Muslim community.

Height and weight were measured using standardized methods; all the participants wore light clothes without shoes. The body mass index (BMI), calculated as the weight (kg) with 1 kg subtracted to allow for clothing divided by height in meter squared, was used as a measure of obesity and classification implemented as described by Bray[12].

Physical activity was classified as follows (Sabri et al. 2004):

1. Sedentary and relatively inactive: Those who were not practicing sports for more than one hour/ week.
2. Relatively active: Those who were practicing sports for 1 – 3 hours a week.
3. Highly active: Those who were practicing sports for more than 3 hours a week.

Blood pressure measurement was carried out by trained practicing nurses according to the World Health Organization standardized criteria[11]. They were trained for 1 week on the use of the sphygmomanometer and blood pressure measurement techniques in the sitting position. Blood pressure was measured two times from the right upper arm with a random zero sphygmomanometer using a 14-cm cuff, after the participants had rested for 10 minutes, recorded to the nearest mm Hg. Systolic Blood Pressure (SBP) was recorded at the appearance of the first Korotkoff sounds and Diastolic Blood Pressure (DBP) at the disappearance of the fifth Korotkoff sounds. The mean value obtained from three readings was used in the analysis. Hypertension was defined according to WHO criteria as SBP $\geq$ 140 mm Hg and/or DBP $\geq$ 90 mm Hg and or the use of antihypertensive medication[11].

Statistical analysis

The data were analyzed using the Statistical Packages for Social Sciences [SPSS][13]. Student's t-test was used to find the difference between means of systolic and diastolic blood pressure among hypertensives and non-hypertensives, while Mann-Whitney test was used for non-parametric distribution. The chi-squared test was used for comparison of frequencies between hypertensives and non-hypertensives and the frequency of other associated socioeconomic and lifestyle factors. The level $p<0.05$ was considered as the cut-off value for significance.

Results

Of the 1000 subjects (500 cases and 500 controls) surveyed, data pertaining to 409 cases from the hypertensive group and 409 controls from the non-hypertensive group were available for the final analysis. The overall response rate for completion of study was 81.8%. The mean and SD of blood pressure among the hypertensive group was (SBP=141.9 ±17.1 and DBP=92.7±9.8) significantly higher than for controls (SBP=116.8±8.7 and DBP=75.7±6.2) ($p<0.0001$). Hypertension was found to be significantly higher among the low income group (35.2% vs. 24.9% controls, $p=0.002$; while mean SBP in the low income group was 130.2±17.6 vs. 128.0±17.4 controls, $p=0.022$).

Table I shows the association between hypertensive and non hypertensive subjects according to the income levels by sex and nationality. Among the total cases studied, 35.2% of the hypertensive subjects were significantly in the less income group (<5000 Dhs) while low income non-hypertensive controls were only 24.9%; $p=0.002$. Likewise among males, the hypertensive subjects were significantly more in the less income group (36.7% vs. 25.0%; $p=0.011$). Among the expatriates, 55.4% were hypertensive. Majority of the expatriates belonged to the low income group and difference was significant (52.1% vs. 30.0%; $p<0.001$).

Table II represents the lifestyles and eating habits of subjects compared to their income levels. Among males, smokers and alcohol drinkers were more likely to be of low income group but only smoking showed significant difference $p=0.016$. Subjects were more

likely to be active in the group with higher income level but no significant difference could be noted. There were statistically significant differences between low and high-income groups with respect to animal fat consumption ($p<0.001$) and cholesterol level ($p<0.001$).

Table III shows the relationship between some important risk factors and monthly income level for the UAE national subjects. The percentage of inactive subjects (55.2%) and current smokers (17.0%) for the high-income group were higher than the low-income group (54% and 0% respectively), while the prevalence of those currently drinking alcohol (5.0%), animal fat consumption (40.8%), preferring salty food (18.0%) and abnormal cholesterol level (30.8%) for the low-income group were higher than the high-income group (3.8%, 27.6%, 16.4% and 28.1% respectively). There was statistically significant difference between low and high-income groups with respect to BMI ($p=0.014$).

Table IV shows the relationship between some important risk factors and monthly income level for the expatriates. There were statistically significant differences between low and high-income groups with respect to smoking tobacco ($p=0.010$), physical activity ($p=0.044$), animal fat consumption ($p<0.001$) and cholesterol level ($p<0.001$).

Table I: Hypertensive and age matched-control subjects distributed by nationality, monthly income groups and gender.

Monthly Income Groups	Case (n = 409) N (%)	Control (n = 409) N (%)	Odds Ratio (95% Confidence Interval) OR (95% CI)***	P-value *
Total sample				
Less than 5000 Dhs	144 (35.2)	102 (24.9)	1.636(1.20-2.24)	0.002
5000 Dhs or more	265 (64.8)	307 (75.1)		
Total sample (Males)				
Less than 5000 Dhs	80 (36.7)	51 (25.0)	1.739(1.12-2.71)	0.011
5000 Dhs or more	138 (63.3)	153 (75.0)		
Total sample (Females)				
Less than 5000 Dhs	64 (33.5)	51 (24.9)	1.522(0.96-2.41)	0.059
5000 Dhs or more	127 (66.5)	154 (75.1)		
UAE nationals (Total)				
Less than 5000 Dhs	21 (11.2)	29 (15.0)	0.72(0.38-1.36)	0.274
5000 Dhs or more	166 (88.8)	164 (85.0)		
UAE nationals (Males)				
Less than 5000 Dhs	7 (12.8)	13 (16.9)	0.49(0.16-1.41)	0.142
5000 Dhs or more	71 (87.2)	64 (83.1)		
UAE nationals (Females)				
Less than 5000 Dhs	14 (12.8)	16 (14.0)	0.92(0.40-2.12)	0.834
5000 Dhs or more	95 (87.2)	100 (86.0)		
Expatriates (Total)				
Less than 5000 Dhs	123 (55.4)	73 (34.0)	2.43(1.62-3.65)	< 0.001
5000 Dhs or more	99 (44.6)	143 (66.0)		
Expatriates (Males)				
Less than 5000 Dhs	73 (52.1)	38 (30.0)	2.55(1.50-4.36)	< 0.001
5000 Dhs or more	67 (47.9)	89 (70.0)		
Expatriates (Females)				
Less than 5000 Dhs	50 (61.0)	35 (39.3)	2.41(1.25-4.68)	0.005
5000 Dhs or more	32 (39.0)	54 (40.7)		

* P-value for hypertensive and matched control vs. income group.

***OR (95% CI) Odds Ratio 95% Confidence Interval (calculated Mantel-Haenszel test)

Table II: The relationship between some important risk factors and monthly income level for the total sample.

	Income Levels		P-Value
	Less than 5000 Dhs	5000 Dhs or more	
Body Mass Index (mean + SD)	27.7+ (4.7)	28.2 + (5.9)	0.585*
	N (%)	N (%)	
Smoking (for males) **			**0.016**
Never smoked	56 (42.7)	165 (56.3)	
Currently smoking	36 (27.5)	51 (17.5)	
Ex-smoker	39 (29.8)	75 (25.8)	
Total	131 (100.0)	291 (100.0)	
Alcohol drinking (for males) **			**0.421**
Never drink	118 (90.8)	267 (93.0)	
Currently or ex-drinker	12 (9.2)	20 (7.0)	
Total	130 (100.0)	287 (100.0)	
Activity levels			**0.321**
Inactive	137 (55.7)	292 (51.0)	
Relatively active / active	109 (44.3)	280 (49.0)	
Total	246 (100.0)	572 (100.0)	
Salt consumption			**0.374**
Yes	29 (11.9)	82 (14.4)	
No	214 (88.1)	487 (85.6)	
Total	243 (100.0)	569 (100.0)	
Type of fat consumption			**0.001**
Vegetable fat	162 (66.9)	445 (79.0)	
Animal fat	80 (33.1)	118 (21.0)	
Total	242 (100.0)	563 (100.0)	
Cholesterol level			**0.001**
Normal	71 (52.6)	199 (71.1)	
Higher than normal	64 (47.4)	81 (28.9)	
Total	135 (100.0)	280 (100.0)	

* P-value was calculated by using Mann Whitney Test for BMI vs. income groups.

** Number of females who were smoking and drinking alcohol was very small and not significant, thus the study calculated the percentages and P-values of smoking and drinking alcohol for the males only.

Table III: The relationship between some important risk factors and monthly income level for the UAE nationals.

	Income Levels		P-Value
	Less than 5000 Dhs	5000 Dhs or more	
	N (%)	N (%)	
Body Mass Index (mean) (SD)	25.4± (4.0)	27.7± (6.3)	0.014*
Smoking (for males only) **			**0.092**
Never smoked	17 (85.0)	86 (63.7)	
Currently smoking	0 (0.0)	23 (17.0)	
Ex-smoker	3 (15.0)	26 (19.3)	
Total	20 (100.0)	135 (100.0)	
Alcohol drinking (for males) **			**0.795**
Never drink	19 (95.0)	127 (96.2)	
Currently or ex-drinker	1 (5.0)	5 (3.8)	
Total	20 (100.0)	132 (100.0)	
Activity levels			**0.648**
Inactive	27 (54.0)	182 (55.2)	
Relatively active / active	23 (46.0)	148 (44.8)	
Total	50 (100.0)	330 (100.0)	
Salt consumption			**0.779**
Yes	9 (18.0)	54 (16.4)	
No	41 (82.0)	275 (83.6)	
Total	50 (100.0)	329 (100.0)	
Type of fat consumption			**0.058**
Vegetable fat	29 (59.2)	236 (72.4)	
Animal fat	20 (40.8)	90 (27.6)	
Total	49 (100.0)	326 (100.0)	
Cholesterol level			**0.797**
Normal	18 (69.2)	124 (71.7)	
Higher than normal	8 (30.8)	49 (28.1)	
Total	26 (100.0)	173 (100.0)	

* P-value was calculated by using Mann Whitney Test for BMI vs. income groups.

** Number of females who were smoking and drinking alcohol was very small and not significant, thus the study calculated the percentages and P-values of smoking and drinking alcohol for the males only

Table IV: The relationship between some important risk factors and monthly income level for the expatriates.

	Income Levels		P-Value
	Less than 5000 Dhs	5000 Dhs or more	
	N (%)	N (%)	
Body Mass Index (mean) (SD)	28.3 ± (4.7)	29.0± (5.1)	0.121*
Smoking (for males) **			**0.010**
Never smoked	39 (35.1)	79 (50.6)	
Currently smoking	36 (32.4)	28 (17.9)	
Ex-smoker	36 (32.4)	49 (31.4)	
Total	111 (100.0)	156 (100.0)	
Alcohol drinking (for males) **			**0.545**
Never drink	99 (90.0)	140 (90.3)	
Currently or ex-drinker	11 (10.0)	15 (9.7)	
Total	110 (100.0)	155 (100.0)	
Activity levels			**0.044**
Inactive	110 (56.1)	110 (45.5)	
Relatively active/ active	86 (43.9)	132 (31.0)	
Total	196 (100.0)	242 (100.0)	
Salt consumption			**0.668**
Yes	20 (10.4)	28 (11.7)	
No	173 (89.6)	212 (89.3)	
Total	193 (100.0)	240 (100.0)	
Type of fat consumption			**0.001**
Vegetable fat	133 (68.9)	209 (88.2)	
Animal fat	60 (31.1)	28 (11.8)	
Total	193 (100.0)	237 (100.0)	
Cholesterol level			**0.001**
Normal	53 (48.6)	75 (70.1)	
Higher than normal	56 (51.4)	32 (29.9)	
Total	109 (100.0)	107 (100.0)	

* P-value was calculated by using Mann Whitney Test for BMI vs. income groups.

** Number of females who were smoking and drinking alcohol was very small and not significant, thus the study calculated the percentages and P-values of smoking and drinking alcohol for the males only.

Discussion

Hypertension is the most prevalent cardiovascular disease and one of the most powerful contributors to cardiovascular morbidity and mortality, especially due to strokes and congestive heart failure [1,15]. Our finding of a positive association between hypertension and physical inactivity, and smoking habit and obesity are similar to that observed by Johansson and colleagues[16] in a study carried out in Sweden. This has implications for preventive strategies as smoking behaviour, body fat composition and physical activity are shown to be major candidates for possible early interventions[17]. Our study also found that hypertension was more prevalent among female subjects who are above 40 years of age. Moreover, they were illiterate, on low income and living in urban areas with poor housing facilities when compared to the educated and professional subjects.

Perhaps the commonest link to hypertension for all these socio demographic factors is physical inactivity. If this were the case, this would suggest a number of potentially modifiable factors that could be targeted for intervention. Earlier studies have shown that the mean intensity of leisure time physical activity had a positive dose-response relationship with level of education and income[18]. It has now been shown that married or engaged men have a shorter duration of physical activity especially in urban areas. In contrast, less educated, lower income and unemployed or retired men had a lower mean intensity of physical activity than others[18]. The authors of the above study found that physical activity protects against poor health irrespective of BMI and smoking. Our finding that hypertension was more prevalent among expatriates than UAE nationals is in keeping with previous findings of a Swedish study[19], which found that foreign-born individuals had a higher risk for poor health than Swedes after adjustment for socio-demographic and life style factors.

In the present study, hypertension was found to be associated with poor health status as indicated by higher lipid levels, history of heart disease, renal disease and diabetes. As mentioned previously, income distribution acts as a summary of contributors to relative deprivation and is closely related to psychosocial variables that are likely to impact on health. In addition to that, income is critically important, as it provides access to other physical factors (e.g., goods and services, high-quality education, medical care, good housing). Nevertheless, measuring income is not a simple task: individual or family income can be affected by family size, non-cash benefits such as medical, educational services or food stamps. Thus, in terms of income, the relationship is with relative rather than the absolute levels. Previous studies have found that socioeconomic and psychosocial factors strongly affect health, thus making income a good measure to examine the variables that affect the health of the population[9].

It was also found that the prevalence of hypertension for the total sample was inversely associated with income. The mean SBP for subjects in the low-income group was higher than the high-income group and the p-value for the SBP with regard to income groups was significant. However, this significant increase was not observed for diastolic blood pressure. Furthermore, income was associated inversely with smoking habits, animal fat consumption and cholesterol levels, while there was no significant difference between BMI groups, alcohol drinking and physical activity with income groups. The weakness of the relationship between income and some of the major risk factors for hypertension such as BMI, physical activity and alcohol drinking could explain the weakness of the relationship between SBP and DBP with income. This is consistent with previous results from other developed countries [4,20,21].

However, the pattern of this association was not similar for UAE citizens and expatriates. For expatriates, this association was inversely correlated with income. Our results showed that with few exceptions, there was a significant increase in prevalence of hypertension among low-income groups. By using logistic regression analyses, the likelihood of having hypertension was strongly related to the income levels among the expatriates (i.e. the low-income group at a higher risk). These findings are consistent with what is found in the literature[22].

In contrast, our results showed that there was no significant relationship (p=0.274) between income and prevalence of hypertension among UAE citizens. The study found that subjects in the low-income group had slight elevation of SBP but the prevalence of hypertension and the DBP was slightly higher for the high-income group. No statistically significant relationship between systolic and diastolic blood pressure was observed with income. Previous studies have demonstrated that in societies which are transitional or pre-transitional, higher levels of blood

pressure and a higher prevalence of hypertension may be seen in upper socioeconomic groups. This probably represents the initial stage of the epidemic of cardiovascular diseases [4, 23, 24].

A recent meta-analysis indicated that lower SES was associated with higher mean blood pressure in almost all studies in developed countries and this association was stronger and more consistent in women than in men. A considerable part of the SES gradient was accounted for by the SES gradient in BMI, smoking and alcohol consumption across the SES groups. In contrast, in undeveloped or developing countries a direct association between SES and blood pressure has often been found which may reflect a higher prevalence of obesity and higher salt and alcohol intake among those of higher SES[4,6,25]. Our study showed the opposite. There was no statistically significant relationship between income and blood pressure among female subjects. Moreover, there was no significant relationship between body mass index, smoking, drinking alcohol, cholesterol level and physical activity with income groups (information not shown). This could explain the non-significant relationship between income and blood pressure among female subjects.

The association between SES factors and blood pressure in the developing world may also be influenced by the appearance of new risk factors for hypertension. However, little is known about the distribution of other potential risk factors such as birth weight and psychosocial stress, which may also have an impact on the poor people[25]. There was a different pattern of the association between blood pressure and income with respect to gender. In the total sample, the prevalence of hypertension among the male subjects in the low-income group was significantly higher, relative to those in high-income group and there was a statistically significant relationship between both systolic and diastolic blood pressure with low-income. In contrast, there was no statistically significant relationship between the prevalence of hypertension and DBP with income groups among the female subjects.

Conclusion

Our present finding of a statistically significant association between income and hypertension among expatriates in UAE is interesting and deserves further explanation as to the possible mediating factors. This in turn might shed light on the preventive and intervention strategies that might be effective in this community.

References

1. Bener A, Al Suwaidi J, El Menyar A, and Gehani A. The effect of hypertension as a predictor of risk for congestive heart failure patients over a 10-year period in a newly developed country, Blood Pressure, 2004; 13: 41-46.
2. House JS. Understanding social factors and inequalities in health: 20th century progress and 21st century prospects. J Health Soc Behav. 2002; 43(2): 125-42.
3. Luepker RV, Rosamond WD, Murphy R, Sprafka JM, Folsom AR, McGovern PG & Blackburn H. Socioeconomic status and coronary heart disease risk factor trends. The Minnesota Heart Study. Circulation. 1993; 88(part 1): 2172-79.
4. Colhoun HM, Hemingway H, Poulter NR (1998) Socio-economic status and blood pressure: an overview analysis. J Hum Hypertens 1998; 12: 91–110.
5. Murray CJL, Lopez AD. Global mortality, disability and the contribution of risk factors: Global burden of disease study. Lancet. 1997; 349: 1436–42.
6. Orth-Gomer K, Unden AL. Type A behavior, social support, and coronary risk: interaction and significance

for mortality in cardiac patients. Psychosom Med 1990; 52: 59-72.

7. Sabri S, Bener A, Eapen V, Abu Zeid MSO, Al-Mazrouei AM, Singh J (2004). Some risk factors for hypertension in United Arab Emirates; Eastern Mediterranean Health Journal , WHO Bulletin (accepted in the press).

8. Lynch J. Social epidemiology: some observations about the past, present and future. Aust Epidemiol 2000; 7: 7-15.

9. Bener A, Al Suwaidi J, Al Jaber K, Al-Marri S, Elbagie IAE. The epidemiology of hypertension and its associated risk factors in the Qatari Population, Journal of Human Hypertension, 2004; 18: 529-30.

10. Doorslaer E, Wagstaff A & Rutten F (1992). Equity in the Finance and Delivery of Health Care: An International Perspective. Oxford, England: Oxford University Press.

11. Bray GA. Definition, measurement and classification of the syndrome of obesity. Int J Obes, 1978; 2: 99-112.

12. World Health Organization International Society of Hypertension Guidelines for the Management of Hypertension. J Hypertension, 1999; 17: 151-82.

13. Norusis MJ (1998) SPSS Inc. SPSS/PC+ for Windows, Base System and advanced Statistic User's Guide, Window version 11. Chicago, Illinois.

14. Kannel WB, Thom TJ. Declining cardiovascular mortality. Circulation, 1984; 70: 331-6.

15. Al-Suwaidi J, Bener A, Al Binali H, Numan MT. Does Hospitlisation for Congestive Heart Failure occur more frequently in Ramadan: a population based study (1991 – 2001). International Journal of Cardiology, 2004; 96(2): 217-21.

16. Johansson SE, Sundquist J. Change in lifestyle factors and their influence on health status and all-cause mortality. Int J Epidemiol. 1999; 28 (6): 1073-80.

17. Al Suwaidi J, Bener A, S Behair, Albinali HA. Mortality caused by acute myocardial infarction in Qatari Women. Heart, 2004; 90: 693-94.

18. Lakka TA, Kauhanen J, Salonen JT. Conditioning leisure time physical activity and cardiorespiratory fitness in sociodemographic groups of middle-ages men in eastern Finland. Int J Epidemiol 1996; 25 (1): 86-93.

19. Sundquist J. Living conditions and health. A population-based study of labour migrants and Latin American refugees in Sweden and those who were repatriated. [Journal Article] Scandinavian Journal of Primary Health Care - Supplement. 1995; 13(2): 128-34.

20. Yen IH, Kaplan GA. Poverty area residence and changes in physical activity level: evidence from the Alameda County Study. Am J Public Health. 1998; 88: 1709-12.

21. Modan B, Wagener DK. Some epidemiological aspects of stroke: mortality/morbidity trends, age, sex, race, socioeconomic status. Stroke 1992; 23: 1230-236.

22. Diez-Roux AV, Nieto FJ, Caulfield, Tyroler HA, Watson RL & M Szklo M. Neighbourhood differences in diet: the Atherosclerosis Risk in Communities (ARIC) Study. J Epidemiol Community Health 1999; 53: 55-63.

23. Mendez MA, Cooper R, Wilks R, Luke A, Forrester T. Income, education, and blood pressure in adults in Jamaica, a middle-income developing country. Int J Epidemiol. 2003; 32(3): 400-8.

24. Singh RB, Sharma JP, Rastogi V, Niaz MA and Singh NK. Prevalence and determinants of hypertension in the Indian social classes and heart survey. J Hum Hypertension 1997; 11(1): 51-56.

25. Gupta SP, Siwach SB & Moda VK. Epidemiology of hypertension based on total community survey in rural population of Haryana. Ind Heart J 1997; 20: 511-15.