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Abstract

Background: The economic deprivation of most slum inhabitants, and the lack of services and facilities may increase their vulnerability to unhealthy lifestyles and cardiovascular diseases.

Aims: This study aimed to determine the prevalence of modifiable risk factors for cardiovascular diseases in slum residents in Cairo, Egypt and evaluate their association with hypertension.

Methods: A household cluster survey was conducted in Mansheiet Nasser, a large slum area in Cairo. The study included 984 adult participants. The World Health Organization STEPS instrument for noncommunicable disease risk factor surveillance was used to determine the prevalence of smoking, fruit/vegetable consumption, overweight/obesity, physical activity, diabetes and hypertension.

Results: Smoking, insufficient fruit/vegetable consumption, low physical activity and diabetes were reported by 43.4%, 92.2%, 98.4% and 8.7% of the sample respectively. The prevalence of hypertension and overweight/obesity were 31.2% and 73.0% respectively. Most of the participants (83.8%) had ≥ 3 cardiovascular risk factors. A significantly higher proportion of men smoked, engaged in less physical activity, had diabetes and had multiple risk factors. Hypertension was significantly associated with age 30–

Conclusions: Urban slum dwellers in Mansheiet Nasser have an increased vulnerability to

cardiovascular diseases compared with the Egyptian population. Measures are needed to improve their lifestyles and reduce their risk of cardiovascular diseases.

Keywords: Cardiovascular disease, risk factors, hypertension, lifestyle, poverty areas, Egypt

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Introduction

Cardiovascular disease (CVD) is the leading cause of death, representing 30% of all global deaths. Over 80% of deaths from cardiovascular disease take place in low- and middle-income countries (1). Among the 10 leading risk factors for global mortality from cardiovascular disease with their relative contribution are high blood pressure (12.8%), tobacco use (8.7%), high blood glucose (5.8%), physical inactivity (5.5%), overweight and obesity (4.8%), high cholesterol (4.5%), alcohol use (3.8%), and low fruit and vegetable intake (2.9%). Fortunately, they can be controlled, treated or modified (2).

The Egyptian national survey conducted in 2012 showed a higher prevalence of various cardiovascular risk factors than the global and regional figures, especially increased body weight, physical inactivity, and low fruit and vegetable consumption. The prevalence of hypertension and tobacco use were also high, 39.7% and 24.4% respectively (3). The association of urbanization with the increased prevalence of noncommunicable diseases, especially cardiovascular disease, is increasingly evident in low- and middle-income countries (4).

The prevalence of cardiovascular risk factors is reported to be higher among urban slum dwellers (5–9). Egypt has experienced considerable socioeconomic change with increasing urbanization in the past 60 years and migration to urban areas, especially to Cairo, the capital city. This migration has led to the emergence of many slum areas in Cairo, which are characterized by a limited supply of many of the essential services. Although electricity is supplied to all houses, many areas lack water and sanitation services. Parks, sidewalks, sports or recreational facilities are also lacking. These conditions, along with the economic deprivation of most of slum inhabitants, may enhance the adoption of an unhealthy lifestyle. The increasing vulnerability of this deprived population to cardiovascular disease needs to be investigated. This study aimed to measure the prevalence of risk factors for cardiovascular disease among slum residents in Cairo, Egypt, and to determine their association with hypertension.

Methods

Study design and site

This study was a household cluster survey conducted in Mansheiet Nasser, one of the biggest slum areas in Cairo. It developed as an unplanned area and has considerable variation in building quality, ranging from one-story makeshift houses to good quality brick houses (10). Mansheiet Nasser is divided into 8 administrative districts and has an estimated population of about 300 000 people. The active field survey was conducted between June and December 2014.

Study sample

The sample size was calculated assuming: a design effect of 1.5, 10% anticipated non-response rate, 30% prevalence of hypertension, average family size of 6 persons, 50% of the population ≥ 18 years, and 95% confidence level. A sample of 493 households was needed and was selected from each of the 8 districts, proportionate to its population size.

For the selection of households within each district, a mosque, a church, or a school was taken as the starting point from which we walked in a clockwise direction and selected the houses in a systematic random way. Of the 493 households selected, 481 agreed to participate (97.6% response rate). Data were collected from all adults ≥ 18 years (excluding pregnant women) available at the time of the survey who consented to participate and had been resident in the area for ≥ 12 months. Within the households that agreed to participate, none of the adults declined to participate. A total of 984 participants were interviewed with an average of 2 adults per household.

Data collection

The survey was conducted by 2 teams, each consisting of a trained interviewer and a medical assistant from staff of one Mansheiet Nasser health centre.

An interview questionnaire was designed based on the World Health Organization (WHO) STEPS instrument for stepwise surveillance of noncommunicable disease risk factors (11). It included sociodemographic data and questions about smoking, daily amount of fruit and vegetable eaten, physical activity level, and prior diagnosis of diabetes by a doctor or treatment for diabetes. Each item of the questionnaire was reviewed for both face and content validity by experts in epidemiology and public health. After considering their comments, they agreed the final form was valid for measuring cardiovascular disease risk factors and that the questionnaire items were relevant, readable and comprehensive. The questionnaire final form was pilot-tested on 36 households, not included in the study sample. Internal consistency was assessed by the Cronbach alpha coefficient (0.721).

Measurements of body weight to the nearest 0.5 kg and height to the nearest 1.0 cm were taken. Body mass index (BMI) was calculated as weight (kg)/height2 (m2). After filling the questionnaire, 2 blood pressure readings were taken on the right arm with the participant seated using a calibrated mercury sphygmomanometer (Riester; Jungingen Germany). The average of the 2 readings was recorded. American Heart Association guidelines for blood pressure measurements were followed (12). Participants were informed about their blood pressure readings and referred to the health unit if it was high.

Assessment of the validity of the weighing scales, tape measures and sphygmomanometers was performed weekly by taking the measurements of one person on each of the instruments to ensure their standardization.

The household crowding index was calculated as the total number of residents (excluding the newborns) divided by the total number of rooms, excluding kitchen and bathrooms.

The duration of a visit ranged from 15 to 22 minutes. No names were recorded on the questionnaires to ensure anonymity.

Definitions of risk factors

Smoking status: a smoker was anyone who reported currently smoking cigarettes, shisha or

both.

Diabetes was recorded as positive when participants reported a diagnosis of diabetes by a doctor or were receiving treatment for diabetes—insulin or oral hypoglycaemic therapy.

Low fruit/vegetable consumption:

Low physical activity:

Overweight: BMI > 25 to 29.9 kg/m2; obesity: BMI ≥ 30 kg/m2 (11).

Hypertension: systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg (11).

Data management and analysis

Questionnaires were reviewed for completeness and precision. Data coding, entry and cleaning through exploratory analysis and appropriate cross-classification were done.

SPSS, version 17 was used for the analyses (13). Descriptive and analytical statistics were used. The chi-squared test was used to test differences between proportions. Binary logistic regression analysis was done to identify potential risk factors associated with hypertension. The regression analysis included variables that were either significant in the bivariate analysis or were previously known to be independently associated with hypertension. Crude and adjusted odds ratios (OR) were calculated with their corresponding 95% confidence interval (CI). A P-value ≤ 0.05 was considered statistically significant.

Ethical considerations

Informed written consent was obtained from each participant after explanation of the study purpose. For illiterate participants we explained the details of the study and took their verbal consent as there was no/low risk to the participants and potential harm to them was unlikely.

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Ain

Shams University (Approval number: FWA00017585. 2014).

Results

The study included 984 participants, 428 (43.50%) of whom were women. The ages ranged from 18 to 82 years with a mean (SD) of 42.56 (12.70) years.

Table 1 shows that just over half the participants (51.1%) had no education and 59.8% were in low-income families (1. Both men and women had a similar age distribution, educational level and family income. Low fruit and vegetable consumption was reported by 907 (92.2%) participants with no observed difference between men and women. Low physical activity was reported by 968 (98.4%) participants, with women being significantly more active than men (P = 0.021). Tobacco smoking was reported by 427 (43.4%) participants and was significantly more prevalent among men; 73.2% of men smoked compared with 4.7% of women (P

Risk factors for hypertension are shown in Table 2 . In the bivariate analysis, the prevalence of hypertension was significantly higher in those who were older, uneducated, had a family income below the median (800 EGP per month), had diabetes and were overweight or obese. After adjustment for potential confounders, 4 variables were significantly associated with hypertension in the logistic regression model: age, body weight, fruit and vegetable consumption and history of diabetes. Compared to those under 30 years of age, the risk of hypertension was 3 times higher in the age group 30 to

Discussion

The current study was conducted as a cross-sectional household survey in one of the largest slum areas in Cairo Governorate with the participation of 984 individuals. Our results reveal alarmingly high prevalence rates of some important modifiable cardiovascular risk factors.

Adequate daily fruit and vegetable intake was rarely met: low intake seems to be common among Egyptians as seen from our results (92.2%) and from the nationally reported rates in 2012 (95.6%) (3). Among slum dwellers, low intake of fruit and vegetables varies in different countries: it has been reported as only 8% in Nepal but around 50% in Kenya (6,7).

The vast majority of our participants (98.4%) did not reach the minimum level of physical activity recommended for health by WHO (14). This figure is 3 times higher than the national figure for insufficient physical activity reported in the 2012 survey (32.1%) (3). Among residents of urban

slums in other countries, the prevalence of insufficient physical activity was much lower than in our study: 15% to 20% in Kenya and about 30% in both Nepal and India (5–8). Many factors associated with urbanization that are frequently found in our urban slums tend to discourage engagement in physical activity, for example violence, high-density traffic, pollution and low air quality, and the lack of parks, sidewalks and recreational or sport facilities.

Tobacco smoking was more prevalent in our participants (43.4%) than either of the national rates reported in 2012 and 2015, 18% and 20.9% respectively (3,15). Again, smoking was more common in our study compared with studies among slum dwellers elsewhere: in both Kenya and India, smoking prevalence was about 10–12% and in Nepal, it was 35.6% (5–8). The health risk of tobacco smoking is not only from its direct consumption but also from second-hand smoke. Unfortunately, most of our study participants lived in crowded homes (crowding index ≥ 1 in more than 80% of the households). Thus, the probability of indoor exposure to second-hand smoke is high, which highlights the importance of smoking cessation in people living in such conditions.

The prevalence of overweight and obesity in our participants (72.9%) was not greatly different from the national figures for Egypt reported in 2012 and 2015 (66.0% and 76.0% respectively) (3,15). Studies indicate that overweight and obesity are prevalent in all socioeconomic strata in Egypt (15,16). Among slum residents, overweight and obesity varied in different countries and communities, however, it was generally less common than we found among our participants. For example, in Kenya and in Nepal, overweight/obesity was 58% and 30% respectively and in India, it ranged between 32% in Patna and 75% in Hyderabad (5,6,8,9). The high prevalence of overweight/obesity in our participants cannot be explained solely by the low physical activity. We did not enquire about eating habits, body size preference and perception of body image, which may affect people’s weight. Statistical modelling of BMI along with disease incidence, mortality and survival data from national and subnational datasets in the Middle East showed that a small reduction, as low as 1%, in the obesity level would reduce the number of cases per 100 000 population of diabetes by about 1200 and coronary heart disease and stoke by about 800 (17). This finding highlights the need to target multi-morbidity and take preventive action on obesity-associated diseases.

Diabetes was more prevalent in our study participants than in the national survey of 2015 (8.4% versus 4.8%) (15). In fact, previous studies have shown that a higher prevalence of diabetes in deprived areas could be attributed to factors such as low physical activity, cigarette smoking, dietary patterns, and overweight and obesity (18,19). Our data show a high prevalence of such factors, and 2 of them (smoking and low physical activity) were higher than the national rates.

The prevalence of hypertension in our study (31.2%) was much higher than the national rate reported in 2015 (17.2%) and the rate reported from a screening survey in urban Cairo (16.5%) (15,20). The prevalence of hypertension among urban slum populations varies, ranging between 25% and 34% in India and Nepal and about 23% in Kenya (5,6,8,9).

Of concern, 83.8% of our participants had 3 or more of the 6 studied risk factors for cardiovascular disease. This rate far exceeds the reported national figure in 2012, which was 51.1% with 3 or more risk factors (3). Having multiple risk factors for noncommunicable diseases is closely associated with the social determinants of health, with factors such as low level of education, low income, unemployment and deprived living conditions being implicated (21). Therefore, living in an urban slum where all these factors are evident could increase vulnerability to noncommunicable diseases in Egypt.

Our results confirm the well-known association between hypertension and advancing age. The likelihood of suffering from hypertension at age 30 to

Diabetes was also associated with hypertension with the likelihood of hypertension being nearly double among those with diabetes than those without. A strong association between diabetes and hypertension was previously confirmed with strong evidence of sharing common pathways (22).

The significantly higher prevalence of hypertension in obese and overweight individuals that we observed has been previously reported in other studies (20,22,23). The alarmingly high prevalence of overweight and obesity, especially in this less privileged population, might increase the risk of hypertension. Incorporating weight reduction programmes in primary health care could help control obesity-associated diseases including diabetes and hypertension.

Hypertension was significantly more prevalent among participants who had a low fruit and vegetable intake. Our results concur with other observational and intervention studies which reported convincing evidence that high consumption of fruit and vegetable can lower blood pressure (24).

Tobacco smoking was not significantly associated with hypertension in our participants. This finding contradicts other studies (5,8). However, a large nationally representative study in England also failed to find any consistent independent clinically significant difference in blood pressure values between smokers and non-smokers, which concurs with our findings (25). This

lack of association could be partially attributed to the transient effect of smoking on blood pressure, through stimulation of the sympathetic system, which would be lost within half an hour of the last smoke. This period is usually missed when blood pressure is measured both in research studies and in clinical practice (26). More importantly, however, is the evidence that smoking produces arterial stiffness and this predominantly affects central aortic blood pressure and damages key organs (kidneys and heart) rather than brachial blood pressure (27,28).

Our study did not find any relationship between gender and hypertension. This finding is supported by a recently published critical review that reported no gender difference in the overall prevalence of hypertension, but did report differences between age groups (29).

The level of physical activity had no significant relationship with hypertension in our participants. Other studies have reported an association of high and moderate levels of recreational physical activity with lower risk of hypertension (30). This protective effect could not be seen in our group, probably because of the very small proportion (1.6%) who achieved the healthy level of physical activity.

Conclusion

The population living in the Egyptian urban slum was at increased cardiovascular risk, with higher rates of behavioural risk factors and multi-morbidity than the corresponding national rates, namely insufficient physical activity, smoking, diabetes, hypertension, and the simultaneous presence of 3 or more cardiovascular risk factors. The vast majority consumed less than the daily recommended amount of fruits and vegetables, and three quarters were overweight or obese. Hypertension was significantly associated with older age, low fruit and vegetable consumption, diabetes, and overweight/obesity. Behavioural risk factors can be changed but people living in disadvantaged areas are at increased vulnerability to unhealthy lifestyles and hence risk factors for cardiovascular disease because of low levels of income, education and employment, and deprived living conditions. Initiatives are urgently needed to tackle the problem and help slum residents adopt more healthy lifestyles and reduce their risk of cardiovascular disease.

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Hypertension et facteurs de risque cardio-vasculaires associés parmi les habitants de taudis urbains en Égypte : étude populationnelle

Résumé

Contexte : Le dénuement économique dans lequel vivent la plupart des habitants de taudis urbains, ainsi que le manque de services et d'établissements à leur disposition peut les rendre davantage vulnérables à des modes de vie malsains et aux maladies cardio-vasculaires.

Objectifs : La présente étude avait pour objectif de déterminer la prévalence des facteurs de risque modifiables des maladies cardio-vasculaires chez les habitants de taudis urbains du Caire (Égypte), ainsi que d'évaluer leur association avec l'hypertension.

Méthodes : Un sondage par grappes auprès des ménages a été réalisé dans le quartier de Mansheiet Nasser, une importante zone de logements insalubres au Caire. L'étude incluait 984 participants adultes. L'enquête STEPS de l'Organisation mondiale de la Santé pour la surveillance des facteurs de risque des maladies non transmissibles a été utilisée afin de déterminer la prévalence du tabagisme, de la consommation de fruits et légumes, de la surcharge pondérale/de l'obésité, de l'activité physique, du diabète et de l'hypertension.

Résultats : Le tabagisme, une consommation insuffisante de fruits et légumes, une faible activité physique et le diabète étaient notifiés par 43,4 %, 92,2 %, 98,4 % et 8,7 % des personnes respectivement dans l'échantillon étudié. La prévalence de l'hypertension et de la surcharge pondérale/de l'obésité était de 31,2 % et de 73,0 % respectivement. La plupart des participants (83,8 %) présentaient trois facteurs de risque cardio-vasculaires ou plus. Une proportion significativement plus élevée d'hommes fumait, avait une activité physique moindre, souffrait de diabète et présentait des facteurs de risque multiples. L'hypertension était associée de façon significative au fait d'être âgé de 30 à 49 ans (OR = 3,04, IC de 95 % : 1,66-5,58), d'avoir 50 ans ou plus (OR = 12,5, IC de 95 % : 6,71-23,26), à une surcharge pondérale (OR = 1,58, IC de 95 % : 1,0-62,35), à l'obésité (OR = 2,23, IC de 95 % : 1,49-3,35), à une faible consommation de fruits et légumes (OR = 1,88, IC de 95 % : 1,02-3,48), et au diabète (OR = 1,77, IC de 95 % : 1,08-2,92).

Conclusions: Les habitants du taudis urbain de Mansheiet Nasser sont davantage exposés aux maladies cardio-vasculaires comparés au reste de la population égyptienne. Des mesures sont nécessaires afin d'améliorer leurs modes de vie et réduire le risque de maladies cardio-vasculaires.

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.(1.08-2.92 :CI 95% 1.77 = OR)

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