Risk factors for chronic non communicable diseases in Mombasa, Kenya: Epidemiological study using WHO stepwise approach

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Keywords: Chronic non communicable diseases, Risk factors, Health promotion, Epidemiology, Mombasa.

SUMMARY

Objective: To describe the prevalence and distribution patterns of the major common risk factors for non communicable diseases among the people living in Mombasa, Kenya.

Methods: Using the WHO STEPwise approach, risk factors for non communicable diseases were analyzed for 305 people aged between 13 to 67 years. The study sample was arrived at through convenient stratification of the population according to age and setting followed by random selection of the participants.

Results: The most common individual risk factors registered were physical inactivity, hypertension and overweight/obesity accounting for 42%, 24% and 11% of the sample respectively. Participants who possessed a single risk factor profile were 42% and those who had multiple risk factors were approximately 17%. Hypertension and physical inactivity were the most common multiple risk factor pattern possessed by 7.5% of the participants who had at least one of the investigated risk factors for CNCDs. Socio-demographic characteristics including male gender, increasing age, being a student and low socio-economic status were found to be positive predictors of CNCDs

Conclusion: The burden of CNCDs risk factors is unequally distributed among Mombasa residents. The poorest quintile posses the worst risk factor profile compared to their privileged counterparts. The implementation of WHO STEPwise approach was feasible since it revealed a comprehensive picture of the at-risk groups thus forming a vital baseline framework for target-specific and cost-effective CNCDs control and prevention interventions.

[Afr J Health Sci. 2011; 19:24-29]

Introduction

The global disease profile is changing at an astonishing rate, with deaths and disabilities from chronic non-communicable diseases (CNCDs) exceeding those from infectious diseases and nutritional deficiencies [1]. CNCDs which include heart diseases, stroke, type 2 diabetes, cancer and chronic obstructive pulmonary diseases (COPDs) account for almost 60% of global deaths and 47% of the global burden of disease [2]. Recent figures released by WHO [3] indicated that approximately 80% of the global CNCDs deaths occur in low-income and middle-income countries.

health care in infection control and improved general mean life expectancy [4]. This confirms the epidemiologic transition theory which attributes the increasing impact of CNCDs to economic, social and cultural changes which have led to a tremendous increase in risk factors in the developing countries in

The health and socioeconomic impact of CNCDs is currently increasing rapidly, making a substantial contribution towards the total global mortality, global burden of diseases and the loss of disability–adjusted life years (DALYs). In the developing countries, CNCDs are also emerging as a major public health concern, and this is believed to be an attribute of the effects of industrialization, e.g. adoption of a sedentary lifestyle, poor nutrition, cigarette smoking and risky alcohol intake, coupled with improved

which the majority of the world's population lives [5]. Therefore, this suggests that CNCDs have shifted from being regarded as diseases of the Western world or the affluent societies to those of the developing countries and the poor. As indicated recently by WHO [1], only 20% of CNCDs occur in high-income countries, with the majority (80%) occurring in the middle- and low-income countries. There is thus a widespread scientific and public health consensus that the likelihood of developing CNCDs is linked to the exposure of an individual, community or population to a cluster of behavioral risk factors, such as tobacco use, unhealthy diets and physical inactivity. This has been reported in most CNCDs risk-factors surveillance studies in different countries by authoritative authors like Bonita et al [6].

Existing and developing knowledge regarding these risk factors suggests that prevention of future epidemics is possible. As reported in an epidemiological study of risk factors in Switzerland [7], there exists a significant association between CNCDs and some socio-demographic and health factors, including gender, age, ethnicity, level of education and work status. It was further observed that both men and women of low socioeconomic status possessed adverse risk factor profiles. For the Kenyan Department of Public Health to plan and execute a successful and cost-effective CNCDs prevention program, a baseline starting point must be put in place. This essentially involves up-to-date surveillance data on multiple risk factor analysis. The paucity or absolute lack of such vital public health information motivated the undertaking of this survey in Mombasa, Kenya, where data on CNCDs risk factor surveillance is unavailable. This current WHO STEPwise study was therefore motivated by the general lack of documented information concerning the prevalence of the major common CNCDs risk factors and their distribution pattern among people living in Mombasa, Kenya. Such information, it was believed, could form the baseline data for a future extensive study. It was also envisaged that the outcome would inform better decision-making among public health policy planners and health care personnel.

Materials and Methods

The study was conducted in Mombasa, Kenya. Mombasa is Kenya's second largest city, forming the coastal provincial administrative capital. The institutions where the study was conducted included public high schools (4), tertiary institutions (3) and workplaces comprising of a public referral hospital, a security firm and a sanitation and waste disposal company. In addition, a city market place, was used as a community setting. The study was targeted at males and females aged between 15 and 70 years living in Mombasa, Kenya. Stratification of the population was done according to age and gender, as demonstrated by the Kenya National Bureau of Statistics [8]. The convenient settings of public high schools, colleges, universities and workplaces were listed and randomly sampled. The study participants were then randomly selected from the chosen settings to form the study sample. The Yamane formula [9] was used to calculate the study sample, (where n = sample size, N = total population and e = level of precision). Approximately 500 participants were targeted with a composition of 150 high-school learners, 200 university and college students, 100 from workplaces and 50 from communities.

A cross-sectional quantitative design using the WHO STEPwise approach for the surveillance of CNCDs risk factors was used. This framework is a sequential process, starting with gathering questionnaire-based data on key risk factors (Step 1), then moving on to taking simple physical measurements (Step 2), followed by biomedical measurements (Step 3) [6]. The present study, only utilized the first two steps, as advised by WHO for resource-scarce settings like Kenya. Data were gathered using the WHO STEPS framework core and expanded questionnaire. Through close-ended and scaled questions, the questionnaire requires participants to give information concerning socio-demographics, tobacco use, alcohol consumption, physical activities, diet and any history of diabetes and hypertension (Step 1). The next procedure (Step 2) involved the measurement of systolic and diastolic blood pressure and pulse rate. This was done using a *Mars* automatic digital blood pressure monitor (MS – 700AM) with the participants seated and their left arms supported on a flat surface level with the heart. Height and weight for BMI were measured using a *Bio-metric* machine (BMS™), with participants standing flat-footed and without headgear. A flexible (Oppo Pro-Sport) tape measure was used to measure the participants' waist and hip circumference in an erect position. In particular, the researcher took care to ensure that measurements were not taken on top of loose-fitting or heavy clothing.

Data were captured using the Statistical Package for Social Sciences (SPSS V13.0). Descriptive analysis was done using frequencies and percentages to describe the participants and their health-related behavioral patterns and socio-demographic characteristics. Inferential statistical analysis was employed to explore the correlation and association between socio-demographic information and the prevalence of the risk factors among the participants.

Results

A total of 500 questionnaires were distributed to participants in the various settings. Three hundred and five (305) questionnaires were completed and returned to the researcher, yielding a response rate of 61%. The participants were aged between 15 and 63 years, with a mean age of 22.8 years and a standard deviation of 8.6. In this survey, 181 of the participants were male and 124 were female. Table 1 below presents the socio-demographic data of the participants.

Risk factors among study participants

In the current study 9% were smokers, 5% were risky drinkers, 42% were physically in active, 24% hypertensive and 11 % were overweight/obese. Table 2 below highlights the significant associations between risk factors and socio-demographic variables.

Table 1: Socio-demographic information of the study participants

Variables	Frequency	Proportion	Number of participants
Gender			
Male	181	59.3	
Female	124	40.7	305
Age (Years)			
15-19	117	38.6	
20-24	126	41.3	
25-29	22	7.2	303
30 and Above	38	12.5	
Missing	2	0.7	
Level of education			
No formal education	1	0.34	
Primary education	1	0.34	
Primary school completed	101	34.24	
High school completed	130	44.07	295
College/ University completed	59	20.00	
Postgraduate	3	1.02	
Missing	10	3.3	
Work status			
Government employees	18	6.10	
Non Governmental Organization employees	17	5.76	
Self-employed	13	4.41	
Non-paid	4	1.36	
Student	221	74.92	295
Home-makers	7	2.37	
Retired	4	1.36	
Unemployed (Able to work)	11	3.73	
Missing	10	3.3	
Participants setting			
High school	93	17.45	
College/university	124	21.14	
Workplaces and community	74	33.21	291
Missing	14	4.6	

Table 2: Association between risk factors and participants' socio-demographics

Risk factor	Socio demographic variable	p-value
Drinking	Gender	P = 0.03
Physical inactivity	Age	P = 0.03
	Education	P = 0.05
	Work status	P = 0.05
Blood pressure	Age	P = 0.05
	Gender	P= 0.05
	Educational level	P= 0. 05
BMI	Gender	P= 0.01
Diet	Educational level	P = 0.01
Blood sugar levels	Gender	P = 0.03
	Age	P = 0.05
	Educational level	P = 0.05

Males were found to be more likely to be risky drinkers. The majority of the physically inactive participants (79%) were aged between 15 and 19 years and 49% of these participants had only obtained primary education. A statistically significant association was also found between participants' patterns of physical activity and their work status (p=0.05), with students being the most sedentary group, at 63% (n=110), within the work status category.

High blood pressure is one of the known intermediate risk factors for CNCDs. In our current study, participants were classified as hypertensive if the systolic pressure was > 140mmHg and/or diastolic pressure was > 90mmHg, or if they were taking anti-hypertensive medication or had been diagnosed as hypertensive by a medical practitioner in the previous 12 months. A proportion of 28% had had their blood pressure measured by a health care worker in the past 12 months, with 24% diagnosed as hypertensive; all of these were on prescribed anti-hypertensive medication. Of those classified as hypertensive, 59% were female within the gender category while 53% of the hypertensive participants were aged 30 years and above.

The average BMI was 22.5 kg/m^2 with a standard deviation of 4.6. Approximately 19% of the study participants were overweight/obese and the variations in the participants' body mass index (p=0.02) were significantly associated with their gender. Using the Pearson Chi-square test (p=0.05), female gender was seen to be a positive predictor for overweight/obesity, with a 71% majority compared to a 29% male composition (p=0.01).

Diet as one of the known determinants for CNCDs was also investigated in this study. In our analysis, fruit and vegetable consumption, together with cholesterol-free vegetable cooking oil, were used as indicators of proper diet. Daily vegetable consumption was reported by 36% of the respondents, the majority of whom, 44%, consumed only one vegetable serving daily. Vegetable oil was reportedly the cooking oil of choice for the majority of the participants, with 66% using it in their daily household cooking. A statistically significant association (p=0.01) was found between level of education and fruit and vegetable consumption, with 60% of the participants who ate fruits on most days of the week and 56% of those who reported eating vegetables possessing more than high school education.

Raised blood sugar levels or metabolic syndrome is equally a major risk factor for CNCDs globally. In our analysis, 13% (n=40) of the participants had had their blood sugar measured by a health care professional in the previous 12 months, 30% (n=12) of them being diagnosed as diabetic. Of these, 40% (n=16) were on injectable insulin, while the rest were on oral drugs and a specially prescribed diet. Increasing age, male gender and high level of educational attainment were found to be directly proportional to elevated blood sugars.

In this study, 44% of the subjects possessed none of the investigated risk factors for CNCDs. Apart from the participants with either none or one risk factor profile, some participants possessed multiple risk factors, co-occurring in clusters and varying in their combinations. Those with two risk factors were 13% while those with three risk factors or more comprised 4%. It was observed that more females (62%) had at least one risk factor, as opposed to 51% of their male counterparts. The most prevalent risk factor was physical inactivity (42%), followed by hypertension (24%), overweight/obesity (11%), 9% tobacco use (smoking), and 5% risky alcohol consumption.

Discussion

Socio-demographic characteristics observed in this study, such as age, gender, level of education and work status, are known to be substantial determinants for CNCDs risk factors [3]. The distribution of CNCDs in a population can therefore be analyzed on the basis of these variables. Previous CNCDs risk factor studies globally and regionally by Fine et al [10] and Pampel [11] unanimously demonstrated that some socio-demographic characteristics, including gender and level of education, are indicators of an individual's health

profile. A study in China [12] reported a significant association between male gender and smoking, while a similar study in the United Republic of Tanzania [13] linked males with risky alcohol consumption. In our present study gender played a significant role in risky alcohol consumption and elevated blood sugar levels. In addition, females were also found to be significantly associated with hypertension and overweight/obesity.

In this study, the level of education was used as an indicator of an individual's socio-economic position. With the majority of participants, 44% (N=295), having attained only up to high school education, the represented population may be expected to possess a higher risk factor mean score, thus adversely exposing them to the development of CNCDs. This relates to reports by Nawi et al [14] in the Indonesian study that socioeconomic position is inversely proportional to the mean number of risk factors for non-communicable diseases, and populations with low socioeconomic status, determined either by income or level of education, are therefore relatively at higher risk of developing CNCDs. The socio-demographic characteristics of the Mombasa population as observed in this study seem to make them vulnerable to the known major risk factors for CNCDs, given that male gender, low level of educational attainment and low socioeconomic status were dominant.

Epidemiological studies for CNCDs risk factors have demonstrated that identification and description of risk factors guarantees better understanding of the health transition facing most of the world's populations. Using participants' attained level of education as an indicator for their socioeconomic position (SEP), the results of this study revealed that the burden of CNCDs risk factors is unequally distributed among different SEP classes within the population of Mombasa. Disease prevention and control strategies should therefore be target-specific if any desirable outcome is to be achieved. Our analysis is however in agreement with the findings of studies conducted in America [10] and Indonesia [14]. Consistent with Nawi et al's [14] suggestions, this study show that risk factor surveillance offers a comprehensive picture of the overall CNCDs burden, one which is vital to public health authorities addressing health inequities. According to the literature, there are adequate data on the prevalence and profiles of individual risk factors for CNCDs. Recent studies have however revealed that there exist quite considerable knowledge gaps on the clustering of these risk factors, which are known often to co-occur. The WHO [3] report indicated that for any desirable outcome to be achieved in the prevention and control of CNCDs, governments and public health departments must incorporate identification of the most common clusters of multiple risk factors in their surveillance systems. In this study, 13% of both male and female participants had multiple risk factors. This is consistent with the findings of an American multiple risk factor study by Fine et al [10] which reported a 17% multiple risk factor prevalence among a nationally representative sample of 29,183 participants. Further analysis revealed inconsistencies in the associations between the subjects' demographic characteristics and the mean number of risk factors possessed. Unlike Fine et al's [10] findings, the present study indicated that gender was significantly associated ($p=0.05$) with participants' mean number of risk factors. More females (54%) in this study had two or more of the risk factors, compared to 46% of their male counterparts.

This study employed the WHO STEPwise protocol in the surveillance of risk factors for CNCDs [3]. In line with the findings of Fine et al [10] survey, our results indicated that physical inactivity was the most prevalent among the investigated risk factors for CNCDs, accounting for approximately 42% of the entire study sample. It has been demonstrated by most leading authors in the field of risk factor surveillance that identification of the most common patterns of risk factors remains an essential fundamental starting point in the planning and implementation of target-specific and cost-effective intervention programs. According to WHO [3], identification of these patterns could assist in predicting the future epidemiology of CNCDs among a given population, community or group at risk.

Previous CNCDs risk factor studies [4, 14] indicated that different populations or socioeconomic classes may possess multiple risk factors in patterns or combinations varying from one another. Complementing these observations, results in our study indicated that the investigated risk factors co-occurred in combinations of two, three and four, with variations in proportions among the participants. Subjects with two risk factors composed the majority 89% (n=38) among those who possessed multiple risk factors. Of these, 68% comprised those who were both hypertensive and physically inactive. However, as observed in the Fine et al [10] study, our results showed that physical inactivity and obesity co-occurred among participants; in the researchers' opinion this is a result of the mutual influence between these two risk factors.

Conclusion

As revealed in our current study, behavioral risk factors for CNCDs, mainly physical inactivity, hypertension, overweight/obesity and smoking, are common among Mombasa residents. The prevalence rates are high and show some increasing trends suggestive of likely future epidemics of CNCDs. Identification and description of the most common patterns of multiple risk factor clusters gave a comprehensive picture of the future epidemiology of CNCDs in Mombasa. This is undoubtedly an essential component of the national health information system.

Implications for practice

According to the results of this study, it appears highly imperative that multi-disciplinary healthcare

professionals must address CNCDs risk factors in their daily clinical practice at all levels, similarly, the authors recommend that basic CNCDs prevention and control models must be incorporated in the training of all healthcare professionals. The findings also highlight that for CNCDs preventive and control interventions to be effective, public health authorities and other relevant stakeholders must exercise targeting in their planning and implementation of health promotion programs.

Acknowledgements:
National Research Foundation (NRF), Republic of South Africa for the funding provided for this project.

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