

Original Research Article

Risk factors associated with development of congestive heart failure among hypertensive patients attending selected health facilities in Kiambu County, Kenya

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ABSTRACT

Background: The study objective was to determine prevalence of congestive heart failure among hypertensive patients attending selected health facilities in Kiambu County, Kenya so as to determine the disease burden in the region.

Methods: This investigation carried out between 1 August to 31 August 2020 applied a cross sectional study design with both quantitative and qualitative approaches. The study employed a variety of sampling approaches to pick the health care facilities where the research was conducted. The sample population was patients seen in the medical outpatient clinic every week and key informants. The inclusion criteria were hypertensive patients attending the MOPC in PCEA Kikuyu hospital and in Thika level 5 hospital and that gave informed consent excluding all critically ill hypertensive subjects and those that had mental disorders. A sample size of 239 study subjects was arrived at. Using questionnaires and key informant interviews, data was obtained. The researchers acquired informed consent from the research participants. The interview took place in two rooms within the medical outpatient clinic facilities where privacy and confidentiality were upheld. Quantitative data was analysed using means, percentages standard deviation to summarize the data especially in helping the researcher know the prevalence of congestive heart failure among the hypertensive patients seen. Qualitative data was analysed by identifying patterns after data collection.

Results: The prevalence of congestive heart failure among hypertension individuals attending selected health facilities in Kiambu County was 9.6% with body mass index, activity level and sedentary lifestyle being associated with development of congestive heart failure.

Conclusions: The prevalence of congestive heart failure is significant with studied modifiable risk factors contributing to congestive heart failure development recommending that the Kiambu County government to investigate ways of lowering the prevalence and addressing the modifiable risk factors.

Keywords: Prevalence, Congestive heart failure, Modifiable risk factors, Non-modifiable risk factors

INTRODUCTION

Congestive heart failure affects more than 26 million individuals in the world and has been connected to a high death rate.¹ It is estimated to have cost more than \$100 billion in 2012. In Africa, CHF has been identified as a leading cause of cardiovascular disease.^{2,3} African

internal medical services have identified CHF as the fifth to sixth most common reason for hospitalization.⁴ When left unchecked, hypertension eventually leads to CHF and the vast majority of CHF patients have a history of high blood pressure. Lack of hypertension in middle age, on the other hand, is correlated with a lower chance of developing CHF later in life.⁵

Kenya has minimal recent published studies on the prevalence of CHF among hypertensive patients). In Kiambu County, this study will update the CHF prevalence among hypertensive patients who attend chosen health institutions which will add to the current body of information. Anecdotal evidence points to a few aspects relating to CHF: It is one of the commonest complications in hypertensive patients in Kenya and also among patients seen in Kiambu County, several patients have late presentation and diagnosis in Kiambu County, high costs of care in CHF management and the complications associated, increased admissions and mortalities among CHF patients. The main objective of this investigation was to determine the prevalence of congestive heart failure among hypertensive patients attending selected health facilities in Kiambu County.

METHODS

The study was a cross-sectional study using quantitative and qualitative methods. A subject was said to have CHF if they meet the clinical criteria for CHF diagnosis. The study was carried out at PCEA Kikuyu hospital (faith-based hospital) and Thika level 5 hospital (public health hospital) medical outpatient clinics were used, each in its own environment. PCEA Kikuyu hospital is in Kiambu County along the Nairobi-Nakuru highway approximately 4 kilometers off the trans-African highway. Every patient diagnosed with hypertension in the medical outpatient clinic for follow up and management and gave informed consent were included for the study. Purposive sampling was also used to select faith-based level 5 hospital and simple random sampling to select level 5 public hospital in Kiambu County. Proportionate sampling was used to select respondents. Quantitative data was analysed using statistical package for social science (SPSS) version 26.0. Quantitative data analysis was done through descriptive statistics and inferential statistics. Descriptive statistics were employed which included: means, percentages and standard deviation to summarize the data and show the prevalence of CHF among the hypertensive patients attending the medical outpatient clinics. Chi square was utilized to check the differences among the respondents from the two study facilities. Qualitative analysis was done through data transcription after the principal researcher read through all transcriptions, sorted out the information, identified patterns and categories that summarized the data obtained. Appropriate logistical and ethical clearances were sought from the respective health facilities, approvals from Kenyatta University and permit to conduct the investigation.

RESULTS

Description of the study respondents

Respondents' socio-demographic factors were taken into consideration. The respondents in the survey had a standard deviation of 12.8, and an average age of 66.6 years. The results indicated that 29.4% and 28.3% of

those who were interviewed in Kikuyu and Thika level 5 hospitals were between 60-69 years respectively ($p=0.005$). The results indicate that the total proportion of females (55.0%) was higher compared to that of males (45.0%). This was consistently higher in the two study areas (Kikuyu hospital=57.8%, Thika level 5 hospital=52.8%). Chi square test indicated that gender proportions in the two sites were significantly different ($p=0.021$). Approximately 69% and 48.0% of the respondents at Thika Level 5 hospital and Kikuyu hospital had primary and below level of education respectively. Chi square tests indicated that the proportion of respondents in different levels of education differed significantly ($p=0.029$). Additionally, on marital status the proportions of married (65.9%) was higher in all the two sites. The biggest proportion of the respondents were Christians (75.5%) with 57.2% of the respondents being unemployed.

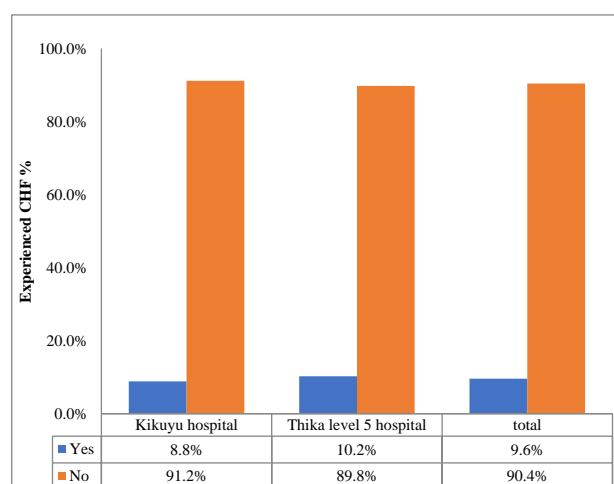


Figure 1: Prevalence of congestive heart failure among hypertensive patients.

Prevalence of congestive heart failure

The results revealed that out of 229 respondents 22 (9.6%) had congestive heart failure. The proportions of the respondents with congestive heart failure were 8.8% (Kikuyu hospital) and 10.2% (Thika level 5 hospital). This finding is contrary from what was reported in the key informant interviews, where the prevalence was slightly higher. "Congestive heart failure (CHF) is an important public health problem in this area and country in general, among the patients at this health facility it approximately 10-15%" (KI 1). Another key informant said, "I don't have the correct figure on this but it's around 10-18% of all hypertensive patients" (KI 2).

Classification of congestive heart failure

The results showed that out of 229 respondents, a large proportion of 137 respondents (60%) had NYHA Class I of CHF, 38% had NYHA Class II of CHF, 2% were NYHA Class III and no respondent in NYHA Class IV.

Modifiable risk factors

Thirteen (59.1%) respondents out of all the respondents diagnosed CHF (22) were overweight and obese which constituted. The number of respondents that spent more than 4 hours in a week sitting and travelling and were diagnosed with CHF was six (27.3%). Among the respondents that developed CHF, 22.7% (5 respondents) had their weight on an increasing trend in the previous six months (Table 2). Eleven respondents (50%) that developed CHF had mild level of physical activity. Ten

respondents (45.5%) that developed CHF had engaged in risky behaviour (cigarette smoking and alcohol intake). Seven respondents (31.8%) who developed CHF had concomitant diseases (DM and CAD). Twelve respondents (54.5%) who developed CHF received lifestyle advice on appropriate diet, weight management, cigarette smoking and exercise. Across different modifiable risk factors: activity level ($\chi^2=7.291$; $df=2$; $p=0.016$), time spent sitting and travelling ($\chi^2=5.855$; $df=1$; $p=0.042$) and BMI ($\chi^2=19.687$; $df=1$; $p=0.0001$) were significantly associated with development of CHF.

Table 1: Demographic characteristics of hypertensive patients.

Characteristics	Total	Kikuyu hospital		Thika level 5		P value
		n=102 Frequency	%	n=127 Frequency	%	
Age ($\mu=66.6$, $\sigma=12.8$) (years)						
Less than 50		44 (19.2)	18	17.6	26	p=0.005
50-59		54 (23.6)	24	23.5	30	
60-69		66 (28.8)	30	29.4	36	
70-79		39 (17.0)	17	16.7	22	
80 and above		26 (11.4)	13	12.7	13	
Gender						
Male		103 (45.0)	43	42.2	60	p=0.021
Female		126 (55.0)	59	57.8	67	
Level of education						
No formal education		42 (18.3)	18	17.6	24	p=0.029
Primary		95 (41.5)	31	30.4	64	
Secondary		69 (30.1)	35	34.3	34	
Tertiary		23 (10.0)	18	17.6	5	
Religion						
Christian		173 (75.5)	68	66.7	105	p=0.024
Muslim		56 (24.5)	34	33.3	22	
Marital status						
Single		47 (20.5)	20	19.6	27	p=0.011
Married		151 (65.9)	67	65.7	84	
Separate/Divorced		14 (6.1)	7	6.9	7	
Widowed		17 (7.4)	8	7.8	9	
Employment status						
Formal employment		33 (14.4)	14	13.7	19	p=0.018
Informal employment		65 (28.4)	26	25.5	39	
Not employed		131 (57.2)	62	60.8	69	
Area of residence						
Urban		84 (36.7)	41	40.2	43	p=0.010
Rural		145 (63.3)	61	59.8	84	

The association of CHF with BMI was complemented by KII and therefore a strong correlation exists between the two variables. However, the KII viewed alcohol and cigarette smoking as associated with CHF, despite the quantitative analysis not finding any significant

association. "Congestive heart failure among hypertensive patients tends to be quite common among obese patients, heavy smokers and heavy alcohol drinkers" (K1 1). Activity levels have strongly been associated with congestive heart failure among hypertensive patients you could look for literature concerning this (K1 3).

Table 2: Modifiable risk factors associated with congestive heart failure.

Variable	CHF		Significance
	Yes N (%)	No N (%)	
BMI			
Normal weight	9 (40.9)	98 (47.3)	$\chi^2=19.687$; df 1; p=0.0001
Overweight and obese	13 (59.1)	109 (52.7)	
Time spent sitting and travelling/week			
Less than 4 hours	16 (72.7)	110 (53.1)	$\chi^2=5.855$; df 1; p=0.042
4 hours and more	6 (27.3)	97 (46.9)	
Weight trend (6 months)			
Increasing	5 (22.7)	57 (27.5)	$\chi^2=3.574$; df 1; p=0.097
Decreasing	17 (77.3)	150 (72.5)	
Activity level			
Vigorous	6 (27.3)	11 (5.3)	$\chi^2=7.291$; df 2; p=0.016
Moderate	5 (22.7)	112 (54.1)	
Mild	11 (50.0)	84 (40.6)	
Risky behavior (smoking and alcohol)			
Yes	10 (45.5)	77 (37.2)	$\chi^2=2.103$; df 1; p=0.120
No	12 (54.5)	130 (62.8)	
Concomitant diseases (DM, CAD)			
Yes	7 (31.8)	55 (26.6)	$\chi^2=1.007$; df 1; p=0.652
No	15 (68.2)	152 (73.4)	
Lifestyle advice (diet, weight management, smoking & exercise)			
Yes	12 (54.5)	133 (64.3)	$\chi^2=1.848$; df 1; p=0.095
No	10 (45.5)	74 (35.7)	

Table 3: Family history association with congestive heart failure.

Variable	Congestive heart failure		Significance
	Yes N (%)	No N (%)	
Family history of CHF			
Yes	10 (45.5)	83 (40.1)	$\chi^2=1.097$; df 1; p=0.243
No	12 (54.5)	124 (59.9)	

Table 4: Socio-demographic risk factors associated with congestive heart failure.

Variable	CHF		OR (95% CI)	P value
	Yes N (%)	No N (%)		
Gender				
Male	9 (40.9)	94 (45.4)	1.2 (1.49-5.52)	0.368
Female	13 (59.1)	113 (54.6)	Reference	
Age ($\mu=66.6$, $\sigma=12.8$)				
Less than 60 years	6 (27.3)	92 (44.4)	Reference	0.185
60 years and above	16 (72.7)	115 (55.6)	1.6 (1.95-4.43)	
Marital status				
Single	12 (54.5)	66 (31.9)	Reference	0.917
Married	10 (45.5)	141 (68.1)	0.99 (1.73-7.44)	
Level of education				
No formal education	8 (36.4)	34 (16.4)	Reference	0.261
Formal education	14 (63.6)	173 (83.6)	1.3 (0.48-5.61)	

Non-modifiable risk factors

Ten respondents (45.5%) that developed CHF had a family history of CHF. This was almost equivalent to the respondents that didn't develop CHF but also had family history of CHF. Family history didn't have any association with development of CHF.

Socio-demographic risk factors

Thirteen respondents (59.1%) that developed CHF were female and a 72.7% of the respondents with CHF were aged 60 years old and above and were twice likely to develop CHF (OR=1.6; 95% CI=1.95-4.43; p=0.185). Twelve respondents (54.5%) and that developed CHF were single in their marital status. Fourteen respondents (63.6%) of those that developed CHF had formal education. Across different socio demographic factors that were studied, none of the factors were linked with CHF development.

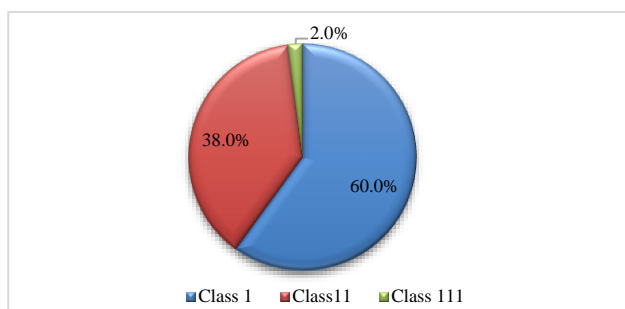


Figure 2: Classification of congestive heart failure among patients.

DISCUSSION

CHF prevalence among the respondents reflected that a small proportion of hypertensive patients attending selected health facilities in Kiambu County developed CHF. An earlier Ghanaian survey had found that prevalence was high at 76%, but the data from this study did not support that finding.⁶ A recent hospital-based

study done in Nigeria on all medical admissions demonstrated a CHF prevalence of 42.5%.⁷ There being limited national published data on CHF prevalence in Kenya including results from the interviews on Key Informants, Kenya Cardiac Society, MOH experts, a comparison with sub-Saharan Africa studies portrays the CHF prevalence on this study being low. The lower CHF prevalence in our study was attributed to several factors as described below.

In our study, a larger proportion of the respondents (63.3%) were rural residents. It is well known that rural residents are more physically active than their urban counterparts owing to the nature of their livelihoods, comparatively lower socioeconomic status that obliges

them to use bicycles or to walk, poor access to necessities such as water, health, education necessitating significant travel to obtain them and lack of access to food groups that increase the risk of CHF. A larger percentage of respondents reported that they had an education level up to primary school (41.5%) compared to those who had completed college/university level (10%). These respondents are more likely to be involved in informal employment, casual jobs and more often hands on jobs that expose them to exercise and subsequent lower prevalence of CHF.

A higher percentage of female respondents (55%) described to have suffered CHF as contrasted to men (45%). A prior study found similar results on prevalence of CHF that indicated the female gender having a higher prevalence in CHF related with intact ejection fraction.⁵ More women than males suffer from congestive heart failure with preserved ejection fraction (HFpEF), suggesting that gender plays a crucial part in illness genesis and progression.⁸ This kind of CHF is likely to be more prevalent in the study sample, increasing the prevalence of CHF in women. Therefore, a comprehensive investigation of female hypertension patients should be conducted in order to determine why this kind of CHF is so common among them. This study should also cover a wide range of preventive interventions for female CHF. The classes of CHF that were prevalent in the MOPC in both facilities were class 1 and class 11 (98% cumulatively for both classes). This signifies that among the hypertensive patients attended in the selected facilities, presentation with CHF amongst these hypertensive patients occurs early. This knowledge is of great significance as if early interventions are taken then there will be a significant reduction in morbidities, costs of treatments, admission rates and mortalities. These results were contrary to a study done in Sub-Saharan Africa that revealed late presentation in high percentages of CHF patients in NYHA class 111 and class IV.⁹ A high BMI was found to be associated with development of CHF among hypertensive patients. These results were expected as this was in tandem with other studies done previously in Kenya and in Sub-Saharan Africa.^{6,8} Men's CHF risk increased by 5% while women's CHF risk increased by 7%, according to the Framingham heart study. This suggests a dose-dependent link between CHF risk and BMI.⁷ Activity level was also associated with development of CHF. The categories were vigorous activity level, moderate or just mild level of activity. Recently, studies have linked physical inactivity to an increased risk of CHF.⁵ Physical inactivity, or sedentary lifestyle and lower cardiorespiratory fitness were associated with an elevated risk for CHF. These associations were consistent for both CHF with preserved ejection fraction and those with reduced ejection fraction.³ Half of the respondents (50.0%) were involved in mild level of physical activity, 27.3% of the respondents engaged in vigorous physical activity while just 22.7% engaged in moderate physical activity. Moderate level of activity is recommended as the

optimum level of physical activity in the prevention of CHF under the guidance of the health provider.² The limitation for this study was language barrier which was solved by translation of the interview guide.

CONCLUSION

The study concluded that the prevalence of CHF in selected health facilities in Kiambu County is 9.6% consequently recommending that the Kiambu County government to investigate ways of lowering the CHF burden in this county. Among the risk factors, three modifiable risk factors and none of the non-modifiable risk factors were associated with development of CHF which denotes that CHF among hypertensive patients attended in selected health facilities in Kiambu County is highly preventable especially with lifestyle changes

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Ethical approval: The study was approved by the Institutional Ethics Committee

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