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Stroke in Maputo central hospital, Mozambique 2019: A glimpse of epidemic or endemicity?

Abstract

Background: Although not a communicable disease, the term "stroke epidemic" is being used widely in the literature. The "epidemic" of stroke might be due to over the time social transmission of unhealthy activities such as unhealthy diet, physical inactivity, and smoking. The aim of this study is to determine the endemic/epidemic pattern of stroke in Maputo Central Hospital in the first semester of 2019.

Methods: A cross-sectional study was carried out collecting secondary data (registered cases) from hospitalized patients with stroke. Data from 2014-18 were used to generate the epidemic thresholds. Four threshold epidemic detection methods were used: mean + 2SD; C-SUM; C-SUM + 1.96SD; and the 3rd quartile. Data from January to June 2019 were used to analyze the 2019 trend over the thresholds.

Results: An epidemic pattern of stroke was observed during the first semester of 2019 when 3rd quartile and C-SUM threshold epidemic method was used. This epidemic pattern of stroke was not observed when mean+2SD and C-SUM+1.96SD threshold epidemic method was used. A relatively stable pattern of stroke occurrence with high registered cases was observed during the study period.

Conclusions: Stroke is an endemic disease for the Maputo Central Hospital, with an epidemic pattern during the first semester of 2019. Adoption of threshold methods for stroke surveillance might well add value for the control of the stroke epidemics.

Keywords: stroke, epidemics, endemic channel, cross-sectional study, Maputo central hospital, Mozambique

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Abbreviations: NCD, noncommunicable disease; WHO, world health organization; MCH, maputo central hospital, SD, standard deviation

Background

Stroke (cerebrovascular accident) is a noncommunicable disease (NCD) currently recognized as a major leading cause for reduced life expectancy at birth globally for men and women. According to World Health Organization (WHO), mortality rates are higher in males, and the reduced life expectancy of males compared with that of females is not due to a single or a small number of causes.[1] The five main causes of death that contribute to a lower life expectancy in males than in females are ischaemic heart disease, road injuries, lung cancers, chronic obstructive pulmonary disease and stroke.[1]

Although not a communicable disease, the term "stroke epidemic" is being used widely in the literature.[2–6] Two terms predominantly used for infectious diseases are herein important to recall: "epidemic" and "endemic". Epidemic is defined as the occurrence in a region or community of a number of excess cases, in relation to what would normally be expected; diseases are called endemic when in a geographical area or population group it presents a relatively stable pattern of occurrence with high incidence or prevalence.[7]

Even if NCDs are non-infectious diseases, they may spread due to the social transmission of unhealthy activities such as unhealthy diet, physical inactivity, and smoking.[8] Therefore, stroke with his potential of social transmission of unfavorable social determinants of health, allow us to borrow the "epidemic" and "endemic" terminology from infectious disease to describe certain occurrence and trends in a particularly geographical area.

The last published article on stroke in Mozambique is dated from 2010. The study shows a crude and adjusted (world reference population) annual incidence rates of stroke of 148.7 per 100,000 and 260.1 per 100,000 aged 25 years, respectively - data from Maputo Central Hospital, 3 general public hospitals, the Military Hospital, and 6 private clinics.[9] Despite these rates, there is a gap of knowledge to determine if stroke is endemic or epidemic in Maputo Central Hospital. The aim of this study is to determine the endemic/epidemic pattern of stroke in Maputo Central Hospital in the first semester of 2019.

Methods

Context

Maputo Central Hospital (MCH) is located in the city of Maputo (capital of Mozambique). Is a quaternary level hospital (the highest level in Mozambique) and is a national reference hospital. The direct catchment-population of the MCH is around 3 million inhabitants, and the indirect catchment-population is around 29 million inhabitants.

Study design

A cross-sectional study was carried out in 2019, collecting secondary data (registered cases) from hospitalized patients with stroke from the years 2014-18, and first semester of 2019. All the Medicine wards from MCH were selected for the study data collection.

Building the endemic channel: Thresholds methods

Four threshold epidemic detection methods were used, namely: i) monthly mean for the past five years plus two times the standard deviation (mean + 2SD); ii) cumulative sum method (C-SUM), which is the mean calculated over the combined previous, current and following months' data for the past five years; iii) C-SUM + 1.96SD; and iv) the 3rd quartile, which is the second highest value noted for the month over the past five years.

Description of the threshold methods

Mean + 2SD: uses the previous five years' data to construct an admissions profile for an average year at that location. The alert threshold for each month is then determined as the mean plus two times the standard deviation.

C-SUM: is based on the construction of an average or base year by calculating the expected number of cases using the average for that month (and the previous and following month) during the past five years.

C-SUM + 1.96SD: is based on C-SUM method refined by adding a 95% confidence interval.

Third quartile: is based on the using of 3rd quartile for each month during the past five years. If the current month's cases exceed quartile 3, an alarm is triggered – epidemic zone.

Outcomes of interest

The main outcomes are: (i) stroke cases and percentage per month per year (2014-18); (ii) monthly stroke threshold for the period 2014-18; (iii) stroke cases from January to June 2019.

Statistical analysis

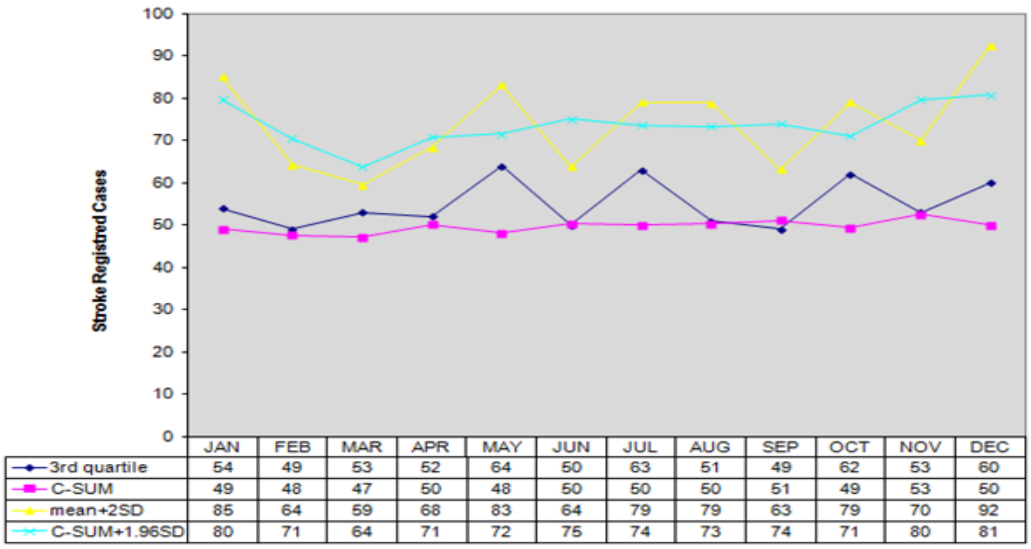
Monthly stroke data from the period 2014-18 and January to June 2019 were collected from the Medicine wards registry books. These monthly data were introduced in a Microsoft® Office Excel® 2007 spreadsheet for organization, analysis and storage of data in tabular form. Data from 2014-18 were used to generate the epidemic thresholds. Data from January to June 2019 were used to analyze the 2019 trend over the thresholds. Graphics were generated to better illustrate the thresholds and for tracking first semester 2019.

Results

The results of the survey show that between 2014 and 2018, about 2.979 cases of Stroke (stroke) were recorded in the MCH, pointing out that the largest difference between the numbers observed between the year 2014 and 2018, was in 2018, where they reported 614 (20.6%) cases of stroke (Table 1). The study showed that the stroke cases recorded in the period 2014-18 show an endemic pattern, with a relatively stable and high pattern of admitted cases. An epidemic pattern is also observed when the 3rd quartile and C-SUM epidemic threshold methods are used (Figure 1).

Table 1 Registered stroke cases and percentage per month per year (2014-18)

Months	Years of analysis											
	2014		2015		2016		2017		2018		2014 - 2018	
	N	%	N	%	N	%	N	%	N	%	N	%
Jan	17	3.0	67	9.8	54	9.1	51	10.0	51	8.3	240	8.1
Feb	32	5.6	45	6.6	49	8.3	40	7.8	58	9.4	224	7.5
Mar	44	7.7	56	8.2	50	8.4	47	9.2	53	8.6	250	8.4
Apr	45	7.8	52	7.6	51	8.6	29	5.7	57	9.3	234	7.9
May	47	8.2	69	10.0	64	10.8	32	6.3	57	9.3	269	9.0
Jun	40	7.0	57	8.3	50	8.4	31	6.1	41	6.7	219	7.4
Jul	39	6.8	55	8.0	41	6.9	68	13.3	63	10.3	266	8.9
Aug	75	13.1	51	7.4	41	6.9	50	9.8	49	8.0	266	8.9
Sept	35	6.1	49	7.1	37	6.3	58	11.3	43	7.0	222	7.5
Oct	62	10.8	64	9.3	59	10.0	35	6.8	58	9.4	278	9.3
Nov	53	9.2	62	9.0	50	8.4	33	6.4	42	6.8	240	8.1
Dec	85	14.8	60	8.7	46	7.8	38	7.4	42	6.8	271	9.1
Total	574	100.0	687	100.0	592	100.0	512	100.0	614	100.0	2.979	100.0



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
3rd quartile	54	49	53	52	64	50	63	51	49	62	53	60
C-SUM	49	48	47	50	48	50	50	50	51	49	53	50
mean+2SD	85	64	59	68	83	64	79	79	63	79	70	92
C-SUM+1.96SD	80	71	64	71	72	75	74	73	74	71	80	81

Figure 1 Monthly stroke threshold and the trend in 2019.

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Discussion

The endemic and epidemic patterns presented in this research can be partially explained by the following factors: i) increased prevalence of hypertension and low awareness, treatment and control among hypertensive patients; ii) increased other modifiable risk factors; iii) better health services and access to Maputo Central Hospital; iv) the reliability of the models.

Hypertension: It is well known that hypertension is a major risk factor for stroke. The prevalence of hypertension in Mozambique increased from 33.1% in 2015 to 38.9% in 2014/15.[10] However, despite this increase, the awareness, treatment, and control among hypertensive patients remained extremely low, with 15%, 7%, and 3%, respectively.[10] The May Measurement Month initiative implemented in 2017 in Mozambique also revealed high proportion of hypertension (31.1%) among screened participants with very few in treatment and more than half of those in treatment were uncontrolled.[11] These low levels of awareness, treatment and control might be one of the triggers for an increase risk of stroke.

Increase in others modifiable risk factors: The increased prevalence and patterns of smoking habits (39.9% in men and 18.0% in women),[12] insufficient physical activity (6%).[13] Overweight and obesity (30.1% and 11.5% in urban areas, respectively),[14] alcohol use (57.7% in men and 28.9% in women),[15] among others modifiable risk factors might additionally contribute for the occurrence of stroke events.

Better health services and access to Maputo Central Hospital: The HCM has a greater capacity to diagnose and treat several diseases, including chronic non-communicable diseases,[12,14] because it is a highly complex health care unit at the national level, besides having a high number of medical professionals, especially specialists.

Reliability of the models: There is no threshold epidemic methods developed for NCDs, and therefore the authors used models tested for infectious disease. Although this can be seen as a limitation, the available models for infectious disease can be temporarily used for surveillance purpose in the absence of more reliable and specific model for stroke and NCDs threshold detection.

Conclusion

The endemicity of stroke pattern for the Maputo Central Hospital might offer a glimpse of what might happening in Maputo city or even in Mozambique. The observed epidemic pattern during the first semester of 2019 might be a result of the interaction of several risk factors that are increased or increasing due to over time social transmission of unfavorable health determinants. Although bold, temporarily adoption of threshold epidemics methods for stroke surveillance might well add value for the control of the stroke epidemics. The authors look forward to seeing other countries' experiences using thresholds methods for stroke surveillance.

Declarations

Ethics approval

The study received authorization from the Institutional Committee on Bioethics in Health - Faculty of Medicine / Maputo Central Hospital (CIBS FM&HCM/106/2018).

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

Authors' contributions

The "first-last-author-emphasis" (FLAE) standard combined with the "sequence-determines-credit" (SDC) standard was applied for author sequence. JAHA and YB designed the protocol, participated in interviewer training, data collection, data analysis, interpretation, and writing the manuscript. MM, participated in drafting, revising the manuscript. All authors read and approved the final manuscript.

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Conflicts of interest

The authors declare no conflicts of interest.

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