

## MORTALITY IN CHAGAS' DISEASE: LIFE-TABLE FOR THE PERIOD 1949-1967 IN AN UNSELECTED POPULATION

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### S U M M A R Y

The Authors have drawn up life-tables over the period 1949-1967 for a group of 1,088 unselected individuals presenting a positive complement fixation test for Chagas' disease, seen during 1949 in Bambuí (State of Minas Gerais, Brazil), the date of diagnosis of the infection being taken as the starting point for these tables.

Of the group comprising individuals younger than 30 years at time of diagnosis, 87.7% survived until 1967, with a mean death rate of  $7.4 \pm 5.65$  per thousand over this span of time; the corresponding figures for the group over 30 years of age are 70.9% and  $19.5 \pm 7.35$ .

The population was surveyed in an area traditionally considered highly endemic for Chagas' disease, severe clinical findings being common in the county.

### I N T R O D U C T I O N

The well-known effect of *Trypanosoma cruzi* upon the heart, and the frequency with which Chagas' myocarditis is found in the hospital wards of central and Southern Brazil, has suggested that this infection must be counted among the main causes for adult death in these areas, although no longitudinal studies in the affected populations have been reported. The present study was undertaken in an attempt at supplying some of this missing information.

The Authors have availed themselves freely of the clinical material collected since 1943 by the late Dr. Emmanuel Dias and collaborators, at the Centro de Estudos de Bambuí (State of Minas Gerais), where pioneer studies in various aspects of Chagas' studies have been carried out over the years (2, 3, 5, among numerous other publications). The present paper is based upon an analysis of part of this material.

### M A T E R I A L A N D M E T H O D S

From 1943 to April, 1967, a total of 3,975 individuals presenting a positive complement fixation test for Chagas' disease have been registered at the Centro de Estudos in Bambuí, of which number 655 have died in the county in the intervening years. Inasmuch as the main scope of work for most of this period comprised an investigation of clinical patterns and pathology in Chagas' disease, in addition to the undertaking of control projects, some selection in favour of individuals presenting advanced symptomatology could not be avoided. During 1949, however, a number of surveys throughout the county were carried out, an analysis by the present Authors indicating that this particular material could safely be presumed to be unselected. A total of 1,088 individuals with positive CFT, almost equally divided as to sex, was registered during this 1949 survey, 176 of this group having died to date. Forty-

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nine per cent of these patients presented at least one positive xenodiagnostic test. Notification of deaths within the county is very thorough. Table I specifies the age distribution at start of the life-table for the entire 1949 group, as well as the age at death of the fatal cases comprised in our material. It will be seen that the 0-9 year group is under-represented owing both to the low prevalence of CFT positives during the first few years of life (6), and to the difficulty in collecting blood for diagnosis in very young children.

TABLE I

Age distribution in 1949 in a group of 1088 individuals with Chagas' disease in Bambuí (Minas Gerais, Brazil); age at time of death of the 176 fatal cases in this material

Age (years)	Age at beginning of study in 1088 individuals		Age at time of death of 176 fatal cases	
	Number	Per cent	Number	Per cent
0-9	71	6.5	2	1.0
10-19	209	19.2	4	2.3
20-29	279	25.7	30	17.0
30-39	240	22.1	33	18.8
40-49	135	12.4	40	22.9
50-59	123	11.3	30	17.0
Over 60	31	2.8	37	21.0

For the purpose of evaluating the proportion of individuals to be excluded from the series over the period of 18 years, 200 file cards were drawn at random among the 912 cases presumed to be still alive, the present whereabouts of these individuals being investigated very carefully. By applying the results to the entire group, we find 299 individuals to have moved out of the county at a known date, an additional 152 not being traceable at present. Bambuí (1966 population of 21,100) offers adequate medical care to its inhabitants and it would be unreasonable to suppose that the severely ill individuals would move elsewhere in search of help. No sudden social or economic changes having occurred in Bambuí within the last 20 years, the Authors feel justified in removing the untraceable 152 individuals evenly over the 18-year period. While we cannot prove this procedure to be unimpea-

chable, such an adjustment of data will tend, if anything, to slightly overestimate the death rate in the county.

## RESULTS

The life table for the entire group, as well as for the two age-groups in which it can be divided, is given in Table II, and reproduced in a graphic form in Fig. 1.

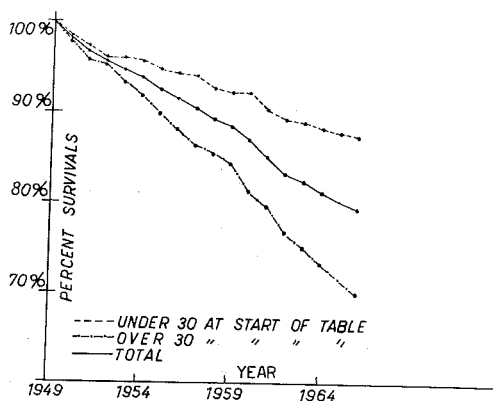


Fig. 1 — See text

## DISCUSSION

The only available mortality data for Chagas' disease is that referring to the acute stage, the figure of 9.7% having been reported from Bambuí<sup>2</sup>. Insofar as the present Authors tend to believe<sup>4</sup> that in only a small proportion of the individuals acquiring the infection overt clinical signs will develop, it is questionable whether these data can be expected to yield an estimate of the total death rate over the first few months of the disease.

Since the start of the life-table coincides with the date of diagnosis, Chagas' disease probably being acquired readily at any age, the duration of infection will vary widely from individual to individual within the group. Therefore we have eschewed to calculate life-expectancy for the group.

Sudden death is a well-known mode of death in Chagas' disease, and this accident is reported for 51% of the obituary in the files at the Centro de Estudos, heart failure accounting for an additional 34%. On the basis of a limited serological survey carried out in the county<sup>6</sup>, it can be estimated that

TABLE II

Life-table for a group of 1088 non-selected individuals with Chagas' disease, investigated in Bambuí (Minas Gerais, Brazil), starting from time of diagnosis

Year	Duration of follow-up period	Number present at beginning of year	Number dropping out during year	Number dying during year	Average number individuals present during year	Deaths per 1000	Probability of surviving to end of year	Proportion surviving at beginning of year
A) All patients								
1949	0	1088	21	18	1069	16.8	0.9832	100.0
1950	1	1049	21	17	1030	16.5	0.9835	98.3
1951	2	1011	21	10	996	10.0	0.9900	96.7
1952	3	980	34	9	958	9.4	0.9906	95.7
1953	4	937	21	8	923	8.7	0.9913	94.8
1954	5	908	47	15	877	15.4	0.9846	94.0
1955	6	846	34	9	824	10.9	0.9889	92.6
1956	7	803	34	8	782	10.2	0.9898	91.6
1957	8	761	21	9	746	12.1	0.9879	90.6
1958	9	731	47	7	704	10.0	0.9900	89.4
1959	10	677	21	11	661	16.6	0.9834	88.6
1960	11	645	21	14	628	22.3	0.9777	87.1
1961	12	610	8	12	600	20.0	0.9800	85.2
1962	13	590	8	6	583	10.3	0.9897	83.4
1963	14	576	21	8	561	14.3	0.9857	82.6
1964	15	547	8	7	540	13.0	0.9870	81.4
1965	16	532	34	4	513	7.8	0.9922	80.4
1966	17	494	21	3	482	6.2	0.9938	79.7
1967	18							79.3

Average deaths per thousand =  $12.8 \pm 4.15$

B) Under 30 years of age (average 18.8 years)								
1949	0	559	10	8	550	14.5	0.9855	100.0
1950	1	541	11	6	533	11.2	0.9888	98.5
1951	2	524	10	7	516	13.6	0.9864	97.4
1952	3	507	17	0	499	0.0	1.0000	96.1
1953	4	490	11	1	484	2.1	0.9979	96.1
1954	5	478	23	5	464	10.8	0.9892	95.8
1955	6	450	17	2	441	4.5	0.9955	94.8
1956	7	431	17	1	422	2.4	0.9976	94.4
1957	8	413	11	6	405	14.8	0.9852	94.1
1958	9	390	24	2	383	5.2	0.9948	92.8
1959	10	370	10	0	365	0.0	1.0000	92.3
1960	11	360	11	7	351	20.0	0.9800	92.3
1961	12	342	4	4	338	11.8	0.9882	90.4
1962	13	334	4	1	332	3.0	0.9970	89.4
1963	14	329	10	2	323	6.2	0.9938	89.1
1964	15	317	4	2	314	6.4	0.9936	88.5
1965	16	311	17	1	302	3.3	0.9967	88.0
1966	17	293	10	1	288	3.5	0.9965	87.7
1967	18							87.4

Average deaths per thousand =  $7.4 \pm 5.65$

C) Over 30 years of age (average 44.0 years)								
1949	0	529	11	10	519	19.3	0.9807	100.0
1950	1	508	10	11	498	22.1	0.9779	98.0
1951	2	487	11	3	480	6.3	0.9937	95.9
1952	3	473	17	9	460	19.6	0.9804	95.3
1953	4	447	10	7	439	15.9	0.9841	93.4
1954	5	430	24	10	413	23.2	0.9768	91.9
1955	6	396	17	7	384	18.2	0.9818	89.8
1956	7	372	17	7	360	19.4	0.9806	88.1
1957	8	348	10	3	342	8.8	0.9912	86.4
1958	9	335	23	5	321	14.2	0.9858	85.7
1959	10	307	11	11	296	37.2	0.9638	84.5
1960	11	285	10	7	277	25.3	0.9747	81.4
1961	12	268	4	8	262	30.5	0.9695	79.4
1962	13	256	4	5	252	19.8	0.9802	76.9
1963	14	247	11	6	239	25.2	0.9748	75.4
1964	15	230	4	5	226	22.1	0.9779	73.5
1965	16	221	17	3	211	14.2	0.9858	71.9
1966	17	201	11	2	195	10.3	0.9897	70.9
1967	18							69.9

Average deaths per thousand  $19.5 \pm 7.35$

24.5% of the entire population present Chagas' infection. Twenty-six percent of the deaths notified in the area over the period 1963-1966 occurred in the absence of medical care. Chagas' disease, "myocarditis", sudden death were reported as the cause of death in 35% of the remaining adults.

The existence of differences in the pathogenicity of various strains of *T. cruzi* is a distinct possibility<sup>1</sup>, thus the present data are not meant to have general validity. Chagas' disease in Bambuí has always been considered hyperendemic, the county offering frequent opportunities for the study of clinically severe heart disease. Thus, fully 32.1% of the electrocardiograms in the present material were grossly abnormal, 15.2% indicating complete right bundle branch block<sup>4</sup>. Even under these conditions, however, the Authors are unable to provide statistical proof that the mortality rate in adults significantly exceeds that observed in the absence of *T. cruzi* infection, though no adequate control groups are available.

No attempt has been made to calculate separate life-tables for the sexes. Females accounted for 31.2% of the obituary in the present series, confirming the well-known finding that, while the prevalence of Chagas' disease does not differ to any extent, male mortality is substantially higher.

At the present time the Authors do not feel qualified to assess the morbidity due to Chagas' disease in Bambuí, any such attempt involving not only an evaluation of invalidism through myocardial damage, but would imply in adding as well the effects upon health of megacolon and megaesophagus, features not as yet adequately investigated in Bambuí. Our general impression, however, is that the majority of the population presenting Chagas' infection manage to live a normal life.

Full assessment of the role of *T. cruzi* infection in the obituary of Latin America will have to be deferred until such a moment when the first results of well-planned longitudinal studies are brought to light. It is, however, necessary to stress that priority ratings in Public Health shall reflect not only the statistical importance of a disease, but will have to depend as well on the feasibility of its control. And at the present time it has become increasingly clear that prophylaxis against Chagas' disease can be accomplished efficiently.

## RESUMO

### *Mortalidade na doença de Chagas: tábua de vida no período de 1949-1967 em uma população não selecionada*

Baseando-se em dados colhidos em 1.088 indivíduos não-selecionados com reação de Machado & Guerreiro positiva, registrados durante 1949 em Bambuí (Minas Gerais), os Autores estabelecem uma tábua de vida para o período de 1949-1967. Como ponto de partida para a tabela tomaram, por conseguinte, a data do diagnóstico da infecção.

Verificaram que para o grupo com idade inferior à 30 anos por ocasião da matrícula, 87,7% sobreviveram até 1967, com uma mortalidade média de  $7,4 \pm 5,65$  nesse intervalo, as cifras correspondentes para o grupo com idade superior a 30 anos sendo  $70,9\%$  e  $19,5 \pm 7,35$ .

A população em pauta foi estudada em região tradicionalmente considerada hiperendêmica para a moléstia de Chagas, sendo freqüente o encontro de formas clínicas severas no Município.

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