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Survival differences in European patients with AIDS, 1979-89

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Abstract

Objectives—To examine the pattern of survival and factors associated with the outcome of disease in patients with AIDS.

Design—Inception cohort. Data collected retrospectively from patients' charts.

Setting—52 clinical centres in 17 European countries.

Subjects—6578 adults diagnosed with AIDS from 1 January 1979 to 31 December 1989.

Main outcome measures—Survival after the time of diagnosis.

Results—The median survival after diagnosis was 17 months, with an estimated survival at three years of 16% (95% confidence interval 15% to 17%). Patients diagnosed in southern Europe had a shorter survival, particularly immediately after the time of diagnosis, compared with patients diagnosed in central and northern Europe (survival at one year (95% confidence interval) 54% (52% to 56%) 66% (64% to 68%), 65% (63% to 66%), respectively. The three year survival, however, was similar for all regions. The regional differences in survival were less pronounced for patients diagnosed in 1989 compared with earlier years. Improved survival in recent years was observed for patients with a variety of manifestations used to define AIDS but was significant only for patients diagnosed with *Pneumocystis carinii* pneumonia. The three year survival, however, remains unchanged over time.

Conclusions—Survival of AIDS patients seems to vary within Europe, being shorter in southern than central and northern Europe. The magnitude of these differences, however, has declined gradually over time. Short term survival has improved in recent years, but the long term prognosis has remained equally poor, reflecting the fact that the underlying infection with HIV and many of the complicating diseases remains essentially uncontrolled.

Introduction

The survival of patients with AIDS may depend on a variety of factors including host factors, the pattern of diseases present, diagnostic routines, and therapeutic interventions. Improved survival of patients over time

has been reported, especially in patients with *Pneumocystis carinii* pneumonia.¹⁻⁸ This may be due to earlier diagnosis, improved treatment, and the introduction of secondary prophylaxis.⁹⁻¹¹ Antiretroviral treatment with zidovudine, which was introduced in 1987, may also have contributed to the observed improvement in survival.^{3,6,12}

We analysed the pattern of survival among 6578 patients from 17 European countries and assessed the association of clinical, demographic, and therapeutic factors on survival. Given the uniquely wide geographical scope of this study, we also focused particularly on possible regional differences in survival and explanations for them.

Subjects and methods

Fifty two centres in 17 countries participated in the study. Centres provided data on all patients (except for 23 Italian centres) diagnosed with AIDS between 1979 and 31 December 1989. The 23 Italian centres each enrolled only a predefined proportion of their patients according to month of birth; this selection was supervised by the Istituto Superiore di Sanita in Rome.

Information was collected from patients' charts on a standardised data collection form and included demography, serology (result of test for HIV antibodies), CD4 cell count within three months of diagnosis; time of initiation and permanent discontinuation of zidovudine; and time of diagnosis of opportunistic infections and malignancies and how these diagnoses were established. AIDS was defined according to the revised criteria from the Centers for Disease Control from 1987.¹³ Time variables were collected as month and year.

The collection of data was performed by retrospective review of case notes between May 1991 and August 1992. Members of the coordinating centre visited all major centres to ensure correct transferral of data from the patients' charts to the data collection form. All forms received by the coordinating centre were checked by scientific staff for logistical errors. A total of 6655 patients were enrolled. Seventy seven patients were excluded because the time of diagnosis of AIDS or time of latest follow up were not known, because clinical information was missing, or because the subject was under 16 years at the time of diagnosis.

STATISTICS

Data were computerised in the dBase IV format and transferred to the statistical analysis system. The procedure LIFETEST was used to generate life tables. To test for univariate differences in survival we used the log rank test. Multivariate analyses (Cox's proportional hazards model) were performed with the PHREG procedure. All survival analyses measured survival as the number of months from diagnosis to death. Thus patients who were given a diagnosis and died within the same month were coded as having a zero survival time.

Baseline characteristics analysed as univariate predictors of survival were age, index disease, sex, year of diagnosis, transmission category, treatment with zidovudine before diagnosis, and CD4 cell count, when available. In addition, based on possible differences in distribution of AIDS defining diseases, transmission categories, therapeutic strategies, and referral of patients for treatment the data were also stratified according to region (see table I).

For the whole population and for patients with CD4 cell counts available a multivariate Cox's proportional hazards analysis was used to estimate the independent contributions of baseline covariates. For many analyses survival curves tended to move closer and in some instances even cross after two and a half years. Since the proportional hazards assumption would otherwise be clearly violated all data used for the multiple regression modelling were censored after two and a half years (unless otherwise indicated). The same variables predicted survival, however, regardless of whether the data were censored after this time.

The results from the multivariate analysis concerning variables other than geographical region were unaffected by adjustment for centre (that is, fitted as 51 dummy variables) instead of adjustment for region (that is, two dummy variables). Entering the CD4 cell count or log CD4 cell count as a continuous variable did not appreciably change the influence of the CD4 cell count as a predictor of survival or its ability to change the relative risks for other variables in multivariate models.

CD4 cell counts are presented as median and 25th and 75th centiles. The Kruskal-Wallis rank sum test

was used to test for differences in CD4 cell count and a χ^2 test for differences in frequency.

Results

PATIENTS

The 6578 evaluable patients represented 22% of the total number of cases of AIDS reported to the World Health Organisation from the participating countries during the study. Of these, 4770 patients (73%) were known to have died. The censoring date for patients still alive was the time of the latest clinical follow up.

Table I shows the characteristics of patients, including demographic data, time of diagnosis, index disease, and CD4 cell count at the time of diagnosis, according to country (and region) of diagnosis. The median age at diagnosis was gradually higher from south to north Europe. Most patients were men (91%), especially in northern Europe.

There were clear differences between the various countries with respect to category of transmission. In most countries homosexual or bisexual contact was the predominant mode of transmission, but in Italy, Spain, and Ireland more patients had a history of injecting drug use.

In central and northern Europe *P carinii* pneumonia, oesophageal candidiasis, and Kaposi's sarcoma were the most common defining diseases. In southern Europe the pattern was more complex, the prevalence of extrapulmonary tuberculosis being significantly higher in Spain and Portugal than in other parts of Europe. The prevalence of toxoplasmic encephalitis as the initial manifestation was significantly higher in southern and central Europe than in northern Europe.

The proportion of patients who were diagnosed with AIDS before 1987 was significantly higher in northern (32%) and central (26%) Europe than in southern Europe (13%).

A total of 2843 patients (43%) received zidovudine at some point during the course of their disease, 491 (7%) having received treatment before diagnosis.

The CD4 cell count at the time of diagnosis was known for 3053 patients (table I). Patients for whom CD4 counts were available had a higher incidence of oesophageal candidiasis and toxoplasmic encephalitis,

TABLE I—Baseline variables at time of diagnosis of AIDS for each participating country

Country	No of subjects (No of centres)	Age median (years)	Men (% of total)	Transmission category (% of total)		Median CD4 cell count ($\times 10^6/l$) (No of patients)	Index disease (% of total)					
				Homosexual	Injecting drug user		<i>Pneumocystis</i> <i>carinii</i> pneumonia only	Kaposi's sarcoma only	Toxoplasmic encephalitis only	Extrapulmonary tuberculosis only	Oesophageal candidiasis only	Non-Hodgkin's lymphoma
South:												
Greece	53 (2)	34	96	76	6	141 (38)	21	21	4	2	0	6
Israel	37 (3)	35	95	70	11	82 (25)	30	19	3	0	8	0
Italy	1009 (24)	30	83	20	71	77 (731)	21	6	6	4	17	4
Portugal	194 (2)	37	94	58	14	— (0)	15	10	7	17	5	2
Spain	823 (2)	30	92	27	69	— (0)	14	6	5	29	9	3
Subtotal	2116 (33)	30	88	29	62	78 (794)	18	7	6	14	12	3
Central:												
Belgium	258 (1)	35	74	38	7	74 (153)	12	18	7	8	13	2
France	610 (1)	36	93	75	10	87 (497)	23	30	9	4	3	2
Germany, south	197 (1)	39	96	87	5	54 (162)	31	22	4	2	7	4
Hungary	29 (1)	35	97	79	0	120 (21)	7	14	0	3	10	0
Luxemburg	19 (1)	36	89	68	21	103 (18)	37	5	5	0	32	0
Switzerland	825 (3)	34	81	48	32	104 (504)	25	13	6	3	10	3
Subtotal	1938 (8)	35	86	60	19	89 (1355)	23	20	7	4	8	2
North:												
Denmark	452 (3)	38	96	81	3	72 (383)	35	12	2	2	12	4
Ireland	55 (1)	30	85	36	62	— (0)	22	11	0	11	18	2
Finland	20 (1)	35	95	90	0	168 (19)	35	30	0	5	0	5
Germany, north	251 (1)	41	100	82	6	115 (220)	25	18	3	1	8	7
Netherlands	317 (1)	38	98	92	3	100 (117)	26	20	4	2	10	5
Sweden	190 (1)	37	98	84	5	70 (147)	49	11	3	1	6	3
United Kingdom	1239 (3)	36	99	93	2	162 (18)	37	23	1	1	6	2
Subtotal	2524 (11)	37	98	88	4	90 (904)	35	19	2	1	8	3
Total	6578 (52)	34	91	60	27	86 (3053)	26	15	5	6	9	3

a lower incidence of extrapulmonary tuberculosis, and a higher age and they more often received their diagnosis in central Europe. They were also more commonly treated with zidovudine before diagnosis compared with patients for whom CD4 cell counts were not available.

The CD4 cell count tended to be lower for patients from southern Europe (median $78 \times 10^6/l$, 25th to 75th centiles 32 to $174 \times 10^6/l$) compared with patients from central Europe ($89 \times 10^6/l$, 33 to $216 \times 10^6/l$) and those from northern Europe ($90 \times 10^6/l$, 30 to $200 \times 10^6/l$) ($P=0.06$). The CD4 cell count for patients diagnosed with extrapulmonary tuberculosis ($172 \times 10^6/l$, 95 to $297 \times 10^6/l$) or Kaposi's sarcoma ($170 \times 10^6/l$, 66 to $322 \times 10^6/l$) was significantly higher than for patients diagnosed with other diseases (median $56-105 \times 10^6/l$) ($P<0.0001$). Over time the median CD4 cell count at the time of diagnosis decreased significantly from $104 \times 10^6/l$ (42 to $250 \times 10^6/l$) before 1987 to $96 \times 10^6/l$ (41 to $225 \times 10^6/l$) in 1987, $78 \times 10^6/l$ (30 to $180 \times 10^6/l$) in 1988, and $72 \times 10^6/l$ (26 to $170 \times 10^6/l$) in 1989 ($P<0.0001$).

Patients who received zidovudine before diagnosis had a significantly lower CD4 cell count at diagnosis ($60 \times 10^6/l$, 20 to $144 \times 10^6/l$) than patients who did not receive zidovudine before diagnosis ($90 \times 10^6/l$, 33 to $204 \times 10^6/l$) ($P<0.0001$).

SURVIVAL

Univariate analyses

Table II shows the results of the univariate analyses. The overall estimated median survival was 17 months, with an estimated survival rate at three years of 16% (95% confidence interval 15% to 17%). Survival was

longer for patients diagnosed in central and northern Europe compared with patients diagnosed in southern Europe. This difference was most pronounced within the first months after the diagnosis whereas the three year survival was similar in the three regions (fig 1, top). Within each of these regions there were large differences in median survival. For countries that enrolled more than 100 patients the median survival varied between 12 and 17 months in southern Europe, 18 and 22 months in central Europe, and 13 and 21 months in northern Europe.

These differences in survival between geographical regions were also present when we considered only those patients diagnosed with *P. carinii* pneumonia (log rank test; $P<0.05$). The same was true for patients presenting with oesophageal candidiasis, Kaposi's sarcoma, and non-Hodgkin's lymphoma. There were no differences in survival between the three regions for patients diagnosed with toxoplasmic encephalitis or extrapulmonary tuberculosis. Subgroups of patients according to age, year of diagnosis, CD4 cell count, homosexuality and bisexuality, and injecting drug use showed similar trends in survival between regions as for the whole population (log rank test; $P<0.05$).

Improved survival was observed for patients diagnosed in or since 1987 compared with patients diagnosed in or before 1986 (fig 1, middle). Survival remained constant between 1987 and 1989. The three year survival was similar regardless of year of diagnosis. The improved survival was significant only for patients diagnosed with *P. carinii* pneumonia (log rank test; $P<0.05$). Improvement in survival over time was observed for all three regions when analysed separately.

Overall survival was significantly shorter for patients

TABLE II—Distribution of cohort according to study variables and length of survival in patients with AIDS in Europe

Variable	No of patients	Median survival (months)	Proportion surviving* (95% confidence interval)		Log rank test
			12 Months	36 Months	
Region:					
South	2116	14	54 (52 to 56)	14 (11 to 16)	$\chi^2=85.1, P<0.0001$
Central	1938	19	66 (64 to 68)	20 (18 to 22)	
North	2524	18	65 (63 to 66)	15 (14 to 17)	
Time of diagnosis:					
Before 1987	1589	13	53 (50 to 55)	15 (13 to 17)	$\chi^2=23.7, P<0.0001$
1987	1341	18	63 (61 to 66)	16 (14 to 18)	
1988	1636	19	66 (63 to 68)	16 (14 to 18)	
1989	2012	18	65 (63 to 67)	17 (13 to 20)	
Zidovudine before diagnosis:					
Yes	491	15	58 (53 to 62)	10 (6 to 14)	$\chi^2=11.4, P=0.00007$
No	6059	17	62 (61 to 63)	17 (15 to 18)	
Unknown	28				
Age at time of diagnosis (years):					
<30	2063	19	65 (63 to 67)	20 (18 to 23)	$\chi^2=106.2, P<0.0001$
30-39	2575	18	65 (63 to 66)	17 (16 to 19)	
≥40	1940	14	55 (53 to 57)	11 (9 to 12)	
Transmission category:					
Homosexual or bisexual	3979	17	64 (62 to 65)	15 (14 to 17)	$\chi^2=8.5, P=0.04$
Injecting drug user	1782	17	60 (57 to 62)	19 (16 to 22)	
Other	680	16	58 (54 to 62)	15 (12 to 19)	
Unknown	137	13	52 (43 to 61)	11 (3 to 18)	
Sex:					
Women	576	18	60 (56 to 64)	16 (12 to 21)	$\chi^2=0.15, P=0.70$
Men	5999	17	62 (61 to 63)	16 (15 to 17)	
Unknown	3				
AIDS defining disease†					
Extrapulmonary tuberculosis only	408	28	74 (69 to 78)	36 (30 to 43)	$\chi^2=443.3, P<0.0001$
Kaposi's sarcoma only	1007	21	73 (71 to 76)	26 (23 to 29)	
Pneumocystis carinii pneumonia only	1690	20	69 (67 to 71)	16 (14 to 18)	
Oesophageal candidiasis only	610	19	64 (60 to 68)	25 (21 to 30)	
Pneumocystis carinii pneumonia and ≥1 other disease(s) except					
Non-Hodgkin's lymphoma	835	12	48 (45 to 51)	7 (to 9)	
Toxoplasmic encephalitis	298	15	54 (49 to 60)	12 (8 to 17)	
Other diseases only‡	807	13	51 (48 to 55)	13 (10 to 17)	
More than one disease except Pneumocystis carinii pneumonia and					
Non-Hodgkin's lymphoma	724	10	41 (37 to 44)	8 (6 to 11)	
Non-Hodgkin's lymphoma, all cases	100	6	28 (22 to 35)	16 (10 to 21)	
CD4 cell count ($\times 10^6/l$):					
<50	1108	14	53 (50 to 56)	9 (7 to 11)	$\chi^2=192.1, P<0.0001$
50-100	576	16	60 (56 to 64)	9 (6 to 12)	
101-200	629	19	65 (61 to 69)	12 (9 to 16)	
201-400	476	21	70 (66 to 74)	29 (24 to 34)	
>400	264	30	81 (76 to 86)	40 (32 to 47)	
Unknown	3525	17	62 (60 to 63)	17 (15 to 18)	

*Derived from Kaplan-Meier life tables.

†Index disease(s) occurring alone ("only") or in combination within first month after diagnosis.

‡Opportunistic infections except those mentioned above, AIDS dementia complex, or the HIV wasting syndrome.

who received zidovudine before diagnosis, although the survival for these patients within the first year after the diagnosis tended to be better compared with patients who did not receive zidovudine before diagnosis (fig 1, bottom).

Patients aged ≥ 40 years had a poorer survival than younger patients. Transmission categories other than homosexual or bisexual contact or injecting drug use had a slightly shorter survival. No significant difference in survival was found by sex. Survival varied significantly according to type of defining disease (table II).

There were no significant differences in overall survival or differences with respect to predictors of a shorter survival between patients with or without known CD4 cell counts at diagnosis, except that transmission category failed to show a significant association with survival in either of the groups. For patients with known CD4 cell counts there was a significant association between CD4 cell count and survival (table II).

Multivariate analyses

With the exception of transmission category each of the variables associated with a shorter survival in the univariate analyses was independently associated with the outcome in the multivariate analysis. Thus, the associations with survival cannot apparently be explained by confounding with other prognostic variables. Figure 2 shows the variables and the relative risks of their categories for patients for whom information was available on all variables included in the model ($n=6548$).

The association between region and survival became clearer after adjustment. The relative risk of dying for patients in central and northern Europe compared

FIG 1—Survival of patients with AIDS stratified for region of diagnosis (top); year of diagnosis (middle); and treatment with zidovudine before diagnosis (bottom)

FIG 2—Cox's proportional hazard model for survival of patients with AIDS. Relative risk with 95% confidence intervals for whole population with known information on variables included in model is indicated ($n=6548$). Relative risk indicates proportionate increase (>1) or decrease (<1) in risk compared with baseline variable of 1 (indicated without confidence interval) with effect of all other variables held constant. Variables for which confidence interval overlaps relative risk of 1 are not significantly different from baseline variable. For further explanation of AIDS defining diseases see legend to table II

with patients from southern Europe was 0.72 and 0.78, respectively, without adjustment and 0.60 and 0.64, respectively, after adjustment. This is because those diagnosed in southern Europe tended to have a more favourable profile in terms of age, year of diagnosis, and defining diseases than those in central and northern Europe. When these differences are accounted for the regional differences in survival are enlarged.

In the subgroup of patients with known CD4 cell count and with the CD4 cell count introduced as a categorised variable the same markers were independent predictors of survival as for the whole population except that the prognosis for patients with Kaposi's sarcoma or extrapulmonary tuberculosis as index diseases was no longer significantly different from the prognosis of patients with *P. carinii* pneumonia (not shown).

Significant interactions ($P<0.001$) were observed between region and year of diagnosis and between region and category of transmission, whereas other prognostic variables failed to show any significant interaction with region. There was a gradual decrease over time in differences in survival between patients diagnosed in central and northern Europe compared with patients diagnosed in southern Europe (table III). The relative risks between the three regions among homosexuals and bisexuals and injecting drug users were similar to those of the whole population. In

TABLE III—Relative risks* of patients diagnosed with AIDS in central and northern Europe compared with patients in southern Europe over time. 95% Confidence intervals are also given

Time of diagnosis	Central Europe	Northern Europe
Before 1987	0.49 (0.40 to 0.61)	0.59 (0.48 to 0.72)
1987	0.56 (0.46 to 0.68)	0.60 (0.49 to 0.72)
1988	0.61 (0.52 to 0.72)	0.63 (0.53 to 0.75)
1989	0.67 (0.57 to 0.79)	0.69 (0.58 to 0.87)

*From Cox's proportional hazard model after adjustment for other variables influencing survival. See legend to figure 2 for explanation of relative risk.

contrast no clear difference in survival according to region was observed for patients in other transmission categories.

Discussion

We found a significant difference in survival in different parts of Europe. The life table curves (fig 1, top) show that this difference was most pronounced within the first months after diagnosis whereas the three year survival was similar among the regions. The regional differences in survival decreased over time. There are large differences in pattern of transmission category and type of initial illness among the regions. Injecting drug use is much more prevalent in southern Europe, but no difference in survival of injecting drug users compared with homosexuals or bisexuals was observed, and controlling for transmission category failed to alter the influence of region on survival. The type of initial illness greatly influenced survival in our study. As patients in southern Europe more commonly presented because of oesophageal candidiasis or extrapulmonary tuberculosis, however, both of which were associated with a fairly good prognosis, the differences in regional mortality were still present after we controlled for type of initial illness. Regional differences in survival were evident for various subgroups of patients according to type of initial illness. Differences in regional survival could not be explained by differences in CD4 cell count at diagnosis. Differences in regional survival are unlikely to be explained by variability in clinical care itself, but clinical care may reflect regional differences in the use of health care facilities in the referral of patients with their defining illness, especially at the beginning of the epidemic.

POOR OVERALL PROGNOSIS

Our results suggest that while the short term prognosis of AIDS patients has improved considerably within recent years the three year survival has remained consistently poor, with less than 20% of the patients surviving. Improvement in survival of patients diagnosed with *P carinii* pneumonia has been shown previously.^{1,3,5,6,8} The earliest of these reports, by Rothenberg *et al*,⁵ included patients diagnosed before the introduction of antiretroviral treatment, suggesting that the observed improvement in survival for patients diagnosed with *P carinii* pneumonia may, at least in part, be explained by earlier diagnosis and secondary prophylaxis.^{9,10} In our study the one year survival for patients diagnosed with *P carinii* pneumonia was 69% compared with 49% in the study by Rothenberg *et al*,⁵ suggesting an additional effect of more recent advances in treatment such as adjuvant glucocorticoids for the treatment of *P carinii* pneumonia¹¹ and antiretroviral treatment.^{3,6,12}

Zidovudine has been shown to be associated with improvement in survival for AIDS patients.^{2,4,6,12,14} We did not evaluate the impact on survival of zidovudine initiated after the AIDS diagnosis, as we wanted to consider only those variables measurable at time of diagnosis. Our study showed that patients who received zidovudine before diagnosis, however, had a

modest but significantly shorter survival than patients who did not receive zidovudine before diagnosis. Patients who received zidovudine before the diagnosis had significantly lower CD4 cell counts at the time of diagnosis, suggesting that zidovudine either delayed the onset of AIDS^{15,16} or that zidovudine treatment before diagnosis was initiated in patients with more advanced HIV infection, who would have a poorer prognosis. The life table curves for patients with and without zidovudine treatment before diagnosis cross within the first year after diagnosis (fig 1, bottom). This indicates that the assumption of proportionality of the Cox's model is violated, resulting in an underestimation of the relative risk of zidovudine treatment before diagnosis on survival. It should be emphasised that factors other than those which we were able to adjust for may separate the group of patients treated with zidovudine before diagnosis compared with the remaining patients.

From our data we could not assess whether early zidovudine treatment improves overall survival compared with late treatment. Our findings, however, are consistent with the results of two controlled trials of early versus deferred treatment.^{17,18} In the Concorde trial of immediate versus deferred zidovudine treatment in asymptomatic patients no differences in clinical progression or survival were found between the two treatment arms after long term follow up.¹⁸ Thus the clinical effect of zidovudine may be limited.

Older age at time of diagnosis was associated with a poorer outcome as also reported previously.^{1,3,5,8} Our finding of an association between the initial defining illness and survival is also consistent with findings in other studies.^{1,3,5,8} The significantly longer survival for patients with Kaposi's sarcoma or extrapulmonary tuberculosis compared with patients with *P carinii* pneumonia in univariate analyses could be explained almost entirely by higher CD4 cell counts at the time of diagnosis—that is, patients were diagnosed earlier in the course of their HIV infection. This study did not confirm previous research that found a shorter survival for women.^{4,5,7,19} The most recent of these reports included 139 predominantly Hispanic women with AIDS who were compared with 7045 men with AIDS.⁷ These contrasting results may reflect differences in the use of antiretroviral treatment, as suggested in the study by Lemp *et al*.⁷

In contrast with previous larger studies of survival of patients with AIDS^{3,7} our study had CD4 cell counts at time of diagnosis available for an appreciable number (46%). Although the group of patients with known CD4 cell count had a different distribution of prognostic variables compared with the remaining patients, the survival of the two groups was similar. There was a significant association between survival and CD4 cell count, underlining that even in patients with late stage HIV infection the degree of immunological impairment is of utmost importance for the prognosis.

LIMITATIONS

Limitations of our study include the multicentre design and that the data were collected retrospectively from patients' records. We attempted to minimise possible bias, however, by having strict inclusion criteria for the centres concerned. Moreover, bias due to enrolment of different categories of patients from different centres was not found as the adjusted relative risk estimates were unaffected when we controlled for individual centres.

Finally, in contrast with most other larger population studies which have been based on surveillance data we had therapeutic and immunological information on a large proportion of the patients, and we believe that our data give a fairly complete reflection

Epidemiological implications

- Length of survival of patients with AIDS depends on several factors
- Presenting illness may affect length of survival
- Patients in southern Europe have shorter survival times, though the differences are declining with time
- Zidovudine seems to improve only the short term prognosis
- Long term prognosis remains poor with over 80% of patients dead three years after diagnosis

of the pattern and changes in survival of European patients with AIDS.

In conclusion, several factors (geographical region, year of diagnosis, use of zidovudine before diagnosis, age, type of defining illness, and CD4 cell count) have been shown to predict the survival of patients with AIDS in Europe. Survival of patients is still limited, reflecting the fact that the underlying HIV infection and the complicating diseases remain a considerable distance from proper therapeutic control. Future prospective population based studies are necessary to monitor changes in survival of patients with late stage HIV infection.

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