Preventable deaths: 16 year study of consecutive deaths in a village in Israel

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SUMMARY. The aims of this study were to examine mortality in one village in Israel and to determine which deaths could have been prevented by identifying those which were associated with avoidable factors or were caused by conditions which would have been amenable to preventive measures. The medical records of all 171 patients (91 males and 80 females) who died in the geographically defined population of 1800 during the 16 year period 1974–89 were reviewed. The mortality rate, adjusted for age, in the second eight year period (1982–89), was significantly lower for females (4.0 deaths per 1000 females per year) than for males (8.5) (P<0.01). Downward trends in the birth rate, stillbirth rate and perinatal mortality rate were found, while there was an upward trend in both mean and median age at death. Of the 171 deaths, 36 (21%) were classified as being associated with a total of 44 factors which could be perceived as being avoidable. Twenty five of the avoidable factors were patient related and of these 17 were smoking (more than 20 cigarettes a day in patients aged less than 70 years who died of a smoking related disease). These findings confirm the need for continuous health education for patients. An audit of mortality in general practice is valuable and may contribute towards the prevention of some deaths.

Keywords: mortality; avoidable mortality; cause of death.

Introduction

MORTALITY is one of the more easily measured indices of the health of a population, yet few studies of mortality have been published from general practice. Hart and Humphreys state that 'for the evaluation of medical care, measures of outcome are better than measures of process, but few practicable measures of outcome are available.'[1] They suggest that a change in mean age at death is a simple and meaningful measure, and that a retrospective search for avoidable factors in individual deaths is the most stringent form of self criticism available to any clinical team. It is therefore worthwhile for each of us to take a critical stroll through his or her professional graveyard at regular intervals.

Seven studies of mortality in general practice have been identified.[1-7] Four of these describe a defined population,[1-4] but

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only Hart and Humphreys[1] discuss deaths that could have been prevented. They determined factors that could have been avoided by patients, general practitioners, hospitals or others. Rutstein and colleagues proposed a list of diseases, untimely death from which could possibly have been prevented by health service intervention.[8,9] Others have modified this list and used it in studies of mortality.[10-14] Researchers are aware that socioeconomic factors can play an important part in mortality. Cochrane and colleagues, for example, have shown that even in developed countries infant mortality is more strongly related to economic and cultural factors than to some forms of health service input.[15]

The aims of this study were to identify trends in different aspects of mortality and to determine which deaths could have been prevented by identifying those which were associated with avoidable factors or were caused by conditions which would have been amenable to preventive measures.

Method

The study was carried out in Gush Halav, an Arab village in Upper Galilee in Israel. The village has about 1800 inhabitants, two thirds of whom are christians, one third muslims. One of us (T S) joined the practice in Gush Halav in 1966 and has worked there almost continuously since then. The practice is run by the trade union sick fund (Kupat Holim), which provides comprehensive insurance.

Deaths occurring in the period 1 January 1974 to 31 December 1989 among all inhabitants of the village, including those who were not registered with the practice (approximately 5%) were included in this study, even if the patient was temporarily resident outside the village at the time of death. The following sources were searched to ensure that all deaths were included: the medical records held at the Gush Halav practice; the pregnancy, birth and infant records held at the mother and child welfare clinic; copies of the death certificates held at the Gush Halav practice with the medical records (for those who died at home), the local hospital (for those who died there), the local office of the ministry of health (for those who died elsewhere) and the area office of the ministry of the interior (authorized copies); and lists of burials held by local christian and muslim religious authorities.

Birth and death rates were calculated and compared with those for Israel as a whole. The general mortality rate was age-adjusted, taking the Israel 1983 census population as the standard.

Causes of death reported on death certificates are notoriously unreliable,[3] and therefore the records were reviewed by two physicians, one who had known the patients (T S) and one who had not (Y N). A decision on the cause of death was reached by consensus, based on the best available information about the patient, having considered all the available documents as well as personal knowledge of the patient. Because of cultural and religious norms, no post mortems were performed. Coding of the cause of death was based on the mortality list included in the Internal classification of diseases (9th revision).[16] In people over 80 years of age distinguishing between coronary heart disease, atherosclerosis, old age or pneumonia as the cause of death is not usually meaningful. They were therefore coded under any of these categories, according to the clinical picture.

Deaths were considered preventable if there had been factors which could have been avoided or if the condition which caused death would have been amenable to preventive measures — improvements in social conditions and/or preventive health services. Avoidable factors were attributed to the patient, the general practitioner, the hospital or others and were classified according to the scheme of Hart and Humphreys,[1] with as few modifications as possible. The conditions which would have been amenable to preventive measures were determined using a synthesis of the various approaches described in the literature.[8-14]

The true age of many of the elderly Arabs in Israel is uncertain. The age of elderly people in this study is therefore based on the best information available and is not necessarily as stated on their identity card. Life expectancy cannot be calculated with small numbers and therefore in this study the mean and median age at death were determined. The statistical significance was set at $P<0.05$, using the Z test for the comparison of two proportions.

Results

During the 16 year study period, 171 inhabitants of the village died: 91 males and 80 females. In the first eight year period there were 80 deaths and in the second period 91 deaths. The total practice population increased by 8.3% between the two periods, from a mean of 1760 in the first period to a mean of 1906 in the second. The percentage of people aged over 65 years dropped from a mean of 7.5% in the first period to 6.7% in the second, although the percentage of patients aged over 80 years rose from 1.2% to 2.1%. Of the 171 deaths 47.4% occurred in people aged 80 years or over. Of the 91 males 27.5% were under 60 years of age when they died compared with 16.2% of the 80 females.

Table 1 shows standard indices of health for Gush Halav, and for Israel as a whole. In Gush Halav the birth rate, stillbirth rate and perinatal mortality rate all showed a downward trend between the two eight year periods but none of these differences was significant. The age-adjusted mortality rate per 1000 population in Gush Halav over the study period, was 7.1 for males and 5.1 for females. This compares with 7.5 and 5.7, respectively for the total population of Israel in 1987–88. This difference is not statistically significant. In the period 1982–89 the mortality rate adjusted for age in Gush Halav was significantly lower for females than for males (Table 1).

The mean and median ages at death for the 171 people in Gush Halav (70.5 years and 80 years, respectively) were slightly higher than the national figures (68.8 years and 75 years, respectively) (Table 1). The mean age of death in Gush Halav increased between the two eight year periods from 68.7 years to 72.1 years, as did the median age of death (78 years to 80 years).

The proportions of deaths from different causes for Gush Halav, compared with Israel as a whole, are shown in Table 2. In Gush Halav cardiovascular disease, cancer and accidents accounted for 67.8% of all 171 deaths. The corresponding figure for Israel as a whole was 67.2%.

Of the 171 deaths, 36 (21.1%) were classified as being associated with a total of 44 factors which could be perceived as being avoidable (Table 3). Twenty five of the avoidable factors (56.8%) were patient related and of these 17 were smoking. None of the deaths resulted from delayed presentation on the part of the patient. There were four avoidable factors related to the general practitioner. All four people to whom these factors applied were housebound elderly women. In one of them there was a delay of three months in the diagnosis of a carcinoma of the stomach. There were eight avoidable factors which were

Table 1. Indices of health for Gush Halav and for Israel as a whole.

	Israel 1987–88[a]	Gush Halav		
		1974–81	1982–89	Overall
No. of births per 1000 population per year	22.7	25.0	20.5	22.4
No. of stillbirths per 1000 births per year	5.3	14.2	3.2	9.0
No. of perinatal deaths per 1000 births per year[b]	10.5	22.8	6.4	14.9
No. of deaths in infants during first year of life per 1000 births per year	10.0	11.3	12.9	12.1
No. of deaths per 1000 population per year adjusted for age[c]				
Males	7.5	5.6	8.5	7.1
Females	5.7	6.2	4.0**	5.1
Mean age at death (years)	68.8	68.7	72.1	70.5
Median age at death (years)	75	78	80	80

[a] Total population (jews and non-jews); reference 17. [b] Number of stillbirths plus number of deaths in first seven days of life. [c] Standard Israel: 1983 census. **Females versus males: $P<0.01$.

Table 2. Cause of the 171 deaths in Gush Halav over the period 1974–89, compared with figures for Israel as a whole in 1986.

	% of deaths	
Cause of death	Gush Halav ($n = 171$)	Israel[a] ($n = 29\ 423$)
Cardiovascular disease	51.5	43.9
Cancer	12.3	18.1
Accidents[b]	4.1	5.2
Congenital abnormalities and perinatal conditions	4.1	2.9
Other	28.0	29.9

[a] Reference 17. [b] Motor vehicle, at work and in the home. n = total number of deaths.

attributable to the hospital; six of these were clinical mismanagement.

Of the 107 people who died of a smoking-related disease — coronary heart disease, atherosclerosis (including cerebrovascular accidents), chronic obstructive lung disease or cancer of the lip, oral cavity, pharynx, lung, bladder or pancreas — 52 smoked (48.6%). Of the 52 smokers 34.6% were under the age of 70 years compared with 20.0% of the 55 non-smokers ($P<0.05$, Z = 1.7). No death from a smoking-related disease occurred in anyone under the age of 49 years whether they smoked or not.

Of the 171 deaths, eight were felt to be caused by five conditions which would have been amenable to preventive measures — premature birth (three), rheumatic heart disease (two), tuberculosis (one), cancer of the uterine cervix (one) and peptic ulcer (one).

Discussion

When interpreting this comparison of the mortality of the population of Gush Halav with the mortality of Israel as a whole, the following facts must be borne in mind. Israel's population

Table 3. Avoidable factors associated with 36 deaths.

Avoidable factors assigned to:	Number (%) of avoidable factors[a] (n = 44)	
Patient		
Smoking[b]	17	
Social isolation	2	
Alcohol abuse[c]	1	
Obesity[d]	5	
Delayed presentation of treatable condition[e]	0	
Total	25	(56.8)
General practitioner		
Failure to follow up actively	1	
Failure to initiate contact with housebound or socially isolated patient	1	
Clinical mismanagement[f]	2	
Total	4	(9.1)
Hospital		
Confused organization	1	
Lack of communication	1	
Unnecessary delay	0	
Clinical mismanagement	6	
Total	8	(18.2)
Other		
Road accidents	3	
Accidents at work	1	
Accidents at home	3	
Industrial disease	0	
Total	7	(15.9)

n = total number of avoidable factors. [a] Some deaths were associated with more than one factor. [b] More than 20 cigarettes a day in patients aged less than 70 years who died of coronary heart disease, atherosclerosis (including cerebrovascular accidents), chronic obstructive lung disease or cancer of the lip, oral cavity, pharynx, lung, bladder or pancreas. [c] In patients less than 70 years. [d] Body mass index >30 in patients aged less than 70 years. [e] Symptoms for more than one month. [f] Including delayed diagnosis following the presentation of early symptoms by the patient.

consists of jews (82.0%), muslims (14.0%), christians (2.3%) and others (1.7%).[17] Each of these groups have different age distributions and mortality rates. In this study two thirds of the population were christians and the remainder muslims. However, the numbers in this study were too small to allow the calculation of separate rates for christians and muslims. In addition, in this study death certificates were not taken at face value and source records were examined for the underlying cause of death. The national mortality data are based on death certificates without any modification and are therefore not strictly comparable.

Between the two eight year periods of the study in Gush Halav there was a decrease in the perinatal mortality rate. Although this decrease was not statistically significant, it was probably due to two factors. When the poor figures for perinatal mortality were reviewed by the practice in 1982, it intensified its activities in providing family planning within the practice (as evidenced by a decrease in the birth rate between the two study periods). In addition, the perinatal care provided by the local hospital improved greatly after 1982. The antenatal care provided in the practice was unchanged in the two study periods.

The mean and median age at death found in this study were higher than the figures for Israel as a whole and showed a rise between 1974–81 and 1982–89. However, as the true age of many elderly Arabs is uncertain these results should be interpreted with caution.

In Hart and Humphreys' study[1] 45% of all deaths were thought to have had avoidable factors, while this was true for 36 of the 171 deaths (21%) in this study. Of the 44 avoidable factors 25 could be attributed to the patient but surprisingly none of the deaths could be attributed to delayed presentation by a patient of a treatable condition. However, these findings confirm the need for continuous health education for patients.

The avoidable factors related to the general practitioner in this survey were all concerned with failure to follow up housebound elderly people. As a result, the practice's register of housebound patients has been updated and the practice nurse visits all of these patients each month and initiates any necessary intervention. In addition, during daily patient contacts patient records are updated regarding smoking habits and help with smoking cessation is offered. The same procedure is followed for weight problems. Mothers are told about the well baby clinic and given instructions about preventing accidents in the home and in the street. We believe that family doctors, especially those working in the same practice for a long time, must audit the outcomes for individuals and their community as a whole regularly.

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