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Six years mortality statistics in a Libyan paediatric hospital

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During the six year period from 1975 to 1980, at Al-Fateh Paediatric Hospital 35,488 sick children under 12 years of age were admitted for in-patient treatment; 3 009 had a fatal outcome. The mortality rate per 1000 admissions and discharges respectively, was 54.9 and 52.1 in 1975; and 135.6 and 119.4 in 1980. The age specific mortality rate per thousand discharges was 219.4 for infants, 32.8 for 1 to 4 years, 21.7 for 5 to 9 years, 25.7 for 10 to 12 years of age. Although the overall mortality rate was almost equal for boys and girls, it was higher for boys below 1 year or over 10 years, and higher for girls between 1 to 9 years of age. The proportion of deaths and admissions was more during winter the season from September to January and during the summer season from May to July. More than 80% of those who recovered were admitted with acute respiratory infection, gastroenteritis, meningitis, diseases of urinary system, acute poisoning and symptoms or ill-defined conditions; whereas, more than 70% of expired cases were admitted with prematurity, gastroenteritis, septicaemia, acute respiratory diseases and congenital malformations. The case fatality in 1980 was 84.5% for septicaemia, 55.5% for prematurity, 41.7% for congenital malformations, 18.9% for malnutrition and 16.1% for diseases of nervous system.

Introduction

For centuries mortality had been the primary determinant of population trends; it still remained so in many developing countries and formed the major challenge to the medical profession. It was the prevention of early deaths especially among infants and children that formed the primary objective of public health and social welfare departments. The mortality statistics were still an indispensable part of "informed decision" although in research fields there was growing concern for other phenomena such as fertility, morbidity, positive health, and provision for and use of health services [6, 7, 13, 17, 19].

Infant and childhood mortality is high in the developing countries. In some of these countries particularly in rural areas nearly one-half of all deaths occurred in infants and children under five years. It was calculated that 97% of all deaths below 5 years of age took place in less developed parts of the world [4, 5, 16, 20].

In the Eastern Mediterranean Region, of the approximately 11 million children born each year, about 1.5 million died in infancy and a further half million before the age of 5 years, constituting a 20% loss of liveborn babies [14]. A large number was due to preventable conditions; about half of them to diarrhoeal disease (often with malnutrition), respiratory dis-

TABLE I

Admitted, discharged

Year	Admissions Total	Discharges			Deaths		
		Male	Female	Total	Male	Female	Total
1975	6 566	3 516	3 068	6 604	203	160	363
1976	7 341	3 770	3 126	6 896	251	217	468
1977	5 951	3 113	2 475	5 588	246	194	440
1978	5 636	2 828	2 202	5 030	287	232	519
1979	4 920	2 413	1 933	4 346	346	278	624
1980	5 054	2 434	1 951	4 385	329	266	595
Total	35 488	18 074	14 775	32 849	1 662	1 347	3 009

eases, immunizable infections and diseases of early neonatal and early childhood periods. The mortality among infants and children occupied a prominent place in the region and appeared to outweigh all other problems.

High child mortality figures, however, dropped quite steeply in the near past. One such drop occurred 20 to 30 years ago when infant mortality rate in Europe and North America dropped from 120 to 26 per 1000 live-births, in many instances despite of economic recession and unemployment [4]. A dramatic decline occurred more recently in general mortality, infant and childhood mortality in Libya along with some other Arab, Asian and South American countries [2]. High childhood mortality is not simply dependent on economic status but is affected by the specific health programmes particularly when the former become ineffective.

Therefore, the problem of infant and childhood mortality has been studied at the Al-Fateh Paediatric Hospital, Benghazi, where annually more than five thousand children utilized the indoor treatment facilities and more than four hundred of them died. Benghazi had a total of 433 301 inhabitants in 1980; from 1972 to 1979, the birth rate fluctuated between 46.1 to 50.6 per 1000 live births and the crude death rate varied from 6.0 to 11.1 per 1000 population [8].

The present study included collection of information from the records of all the sick children aged 12 years or less who were admitted from 1975 to 1980. The conditions were classified according to the international classification of diseases or injuries (1965) and for tabulation included the underlying cause or disease process. The findings were compared with previous reports when available.

Materials and Methods

The hospital at present affords 200 in-patient beds distributed among medical, neonatal, and isolation wards. The staff on

and dead patients, 1975—1980

Discharges and deaths			Mortality rate per 1000 discharges and deaths			Mortality rate per 1000 admissions
Male	Female	Total	Male	Female	Total	
3 719	3 248	6 967	54.5	49.2	52.1	54.9
4 021	3 343	7 364	62.4	64.9	63.5	67.8
3 359	2 669	6 028	73.2	72.6	72.9	78.7
3 115	2 434	5 549	92.1	95.3	93.5	103.1
2 759	2 211	4 970	125.4	125.7	125.5	143.5
2 763	2 217	4 980	119.0	119.9	119.4	135.6
19 736	16 122	35 858	84.4	83.4	84.0	91.6

July 1st, 1981, included 464 members as follows: 9 university teaching staff, 15 registrars and senior registrars, 28 senior house officers, 120 nurses, 50 nursing aids, 39 laboratory specialists and technicians, and 203 administrative and other supportive staff. On the average 10 to 12 interns at a time were posted for paediatric training throughout the year.

Results and Discussion

Year and season

There were 35,488 admissions, 32,849 discharges and 2009 deaths at Al-Fateh Paediatric Hospital during the period from 1975 to 1980 (Table I). The average number of admissions and deaths over the period were: 5914 and 501 per year, 493 and 42 per month, and 16 and 1.4 per day respectively. During the period under review the number of admissions decreased from 6566 in 1975 to 5054 in 1980, but the number of deaths increased from 363 in 1975 to 595 in 1980. The mortality rate between 1975 and 1980 increased from 54.9 to 135.6 per 1000 adminissions and from 52.1 to 125.5 per 1000 discharges (Table I). Thus the mortality rate per unit of admissions or discharges more than doubled in the six year period. However, the general mortality rate and crude birth rate in Benghazi showed no upward trend with only slight fluctuations from year to year [8]. The annual death rate per thousand discharges increased steadily year after year which was documented to be 52.1 in 1975, 63.5 in 1976, 72.9 in 1977, 93.5 in 1978, 125.5 in 1979 and 119.4 in 1980 (Table I).

Monthwise, a higher proportion of deaths were recorded from September to January though more admissions were recorded from May to July. The cumulative average mortality rate ranged from 90 to 106.3 in November, December and January, and 68.2 to 74.2 in May, June and July. The mortality trends were similar whether the denominator was per 1000 admissions or discharges. The mortality rate per 1000 discharges in 1980 also doubled

TABLE II

Mortality rate per 1000 discharges including deaths by month, 1975—80

	Mortality rate per 1000 discharges including deaths					
	1975	1976	1977	1978	1979	1980
January	74.4	90.5	70.2	101.4	115.1	98.9
February	75.9	77.4	81.3	93.7	79.6	137.8
March	84.7	54.9	70.2	80.4	91.8	161.3
April	52.0	48.5	72.7	121.5	128.8	121.2
May	46.9	43.3	27.8	85.2	138.8	148.6
June	63.5	67.1	61.3	78.3	84.7	105.2
July	28.3	46.4	61.4	86.8	115.0	106.0
August	33.7	50.8	110.6	86.9	130.2	105.2
September	39.0	57.8	82.4	92.5	162.6	104.4
October	41.2	72.4	69.0	91.9	138.8	109.8
November	48.5	80.4	89.5	78.1	156.1	116.1
December	54.8	96.0	90.7	127.8	126.1	137.7
Total	52.1	63.5	72.9	93.5	125.5	119.4

for individual months compared to their own rates in 1975 except for the month of January which had only a moderate increase of about 30% during the period (Table II).

Duration of Hospitalization

In 1980, of all dead patients 40.0% died within 48 h, 27.6% between 2–6 days, 15.1% between 7–13 days and 17.6% in 14 or more days. Mean hospitalization before death was 7.3 days with a usual range from a few hours to 64 days. There was a premature baby who stayed for 161 days in the hospital before he died. In 1979, 24.6% and 33.4% of all deaths were reported within 24 and 48 hours, respectively. Many of these children were brought to hospital in extreme conditions of shock and ill-health. Some parents are unwilling to bring their children to the hospital unless it is absolutely necessary and hence caused a delay in examination. Women often wait for their husbands before they transport their sick children to the doctor and often husbands will bring the child to hospital unaccompanied by the mother resulting in inaccurate clinical histories and a delay in treatment. To save the potentially avoidable deaths, the children would have to be brought or referred earlier for hospital admission.

Age

The proportion of dead and discharged cases during 1980 was 90.6% and 56.0% respectively under 1 year, 6.4% and 26.4% between 1–4, 3.0% and 17.6% over 5 years of age (Table

TABLE III

Mortality rate by age and sex, 1980

Age	Discharges				Deaths				Mortality rate per 1000 discharges		
	Male	Female	Total		Male	Female	Total		Male	Female	Total
0—27 days	235	245	480		181	127	308		770.2	518.3	641.6
28—365 days	1 082	894	1 976		127	104	231		117.3	116.3	116.9
Under 1 year	1 317	1 139	2 456	(56.0)	308	231	539	(90.6)	233.8	202.8	219.4
Under 1—4 year	752	405	1 157	(26.4)	15	23	38	(6.4)	19.9	56.7	32.8
Under 5—9 year	263	198	461	(10.5)	3	7	10	(1.7)	11.4	35.4	21.7
Under 10—12 year	104	207	311	(7.1)	3	5	8	(1.3)	28.8	24.1	25.7
Total 0—12 year	2 437	1 948	4 385	(100)	329	266	595	(100)	135.0	132.4	136.5

In brackets: percentages

TABLE IV

Distribution of deaths by age group in Al-Fateh Paediatric Hospital, Benghazi, and Inter-American investigation of mortality in childhood

Age group	Inter-American project, 1973*		Al-Fateh Paediatric, Hospital, 1980	
	No.	Per cent	No.	Per cent
Under 5 years	35 095	100.0	577	100.0
Under 1 year	27 602	78.6	539	93.4
Neonate (less than 4 weeks)	12 674	36.1	308	53.3
Postneonate (4 to 52 weeks)	14 928	42.5	231	40.0
1—4 years	7 493	21.4	38	6.5

* From Puffer, RR and Serrono, CV: Pattern of Mortality in Childhood. Report of Inter-American Investigation of Mortality in Childhood. Pan American Health Organization, Washington, D.C. 1973

III). The population distribution of children of 12 years or less in Benghazi as well as the whole of Libya was composed of 10% infants, 34.6% under 5 years and 54.4% between 5 to 12 years [9, 11]. Thus the proportion of admissions and deaths was 5 to 9 times higher for infants, almost equal for 1 to 4 years and 3 times less for 5—12 years of age than their respective representation in the population.

As to the deaths under 5 years of age, out of 577 (96.9% of the total), 53.3% were among neonates, 40.0% among postneonates; 93.4% for infants and 6.5% for 1–4 years in comparison to 36.1%, 42.5%, 78.6% and 21.4% respectively reported from the Inter-American Project (Table IV).

In 1980, the number of deaths per 1000 discharges was 641.6 for neonates (0–27 days), 116.9 for postneonates (28–365 days), 219.4 for infants (neonates and postneonates together), 32.8 for 1–4 years, 21.7 for 5–9 and 25.7 for 10–12 years of age (Table III). The age specific mortality per 1000 population in the whole of Libya was 78.5 under 1 year (per 1000 livebirths) 10.2 for 1–4 years, 1.8 for 5–9 years, and 1.1 for 10 to 12 years [12]. The age specific mortality rates in 1970–75 for more developed regions of the world ranged from 8.3 to 40.3 for infants and 0.4 to 2.0 for 1–4 years old [17]. Such rates in less developed regions varied from 85 to 130 for infants and 6 to 30 for 1–4 years of age [17]. Thus mortality rates in Libya though lower than the mortality rates of many developing countries were still 2 to 9 times higher for infants and 5 to 25 times higher for the 1–4 years age group in comparison to those reported from most of the developed countries [17, 20].

Within the country the mortality rate was 71 times higher for infants, 9 times for 1–4, 1.6 times higher for 5–9 years of age than that for 10–14 years, the lowest among the Libyan population [12]. The age specific mortality rate per thousand discharges in the present study during 1980 was

30 times higher for neonates, 5 times for postneonates, 1.6 times for 1 to 4 years and 1.2 times for 10 to 12 years of age in comparison to the lowest rate for 5 to 9 years [12, 16]. The risk of death both in developing and developed countries was universally lowest for the 5 to 14 years age group though the highest mortality rates were observed among the elderly in developed countries and among infants in developing countries [12].

Sex

Male children (under 12 years) formed 54.3 of admissions, 56.4% of deaths in the study whereas they form about 48% of the total population in Benghazi. The mortality rate per thousand discharges for boys and girls were 770.2 and 518.3 among neonates, 117.3 and 116.3 among postneonates, 233.8 and 202.8 among infants and 35.4 among the 5–9 years old and 28.8, and 24.1 among those aged 10 years or more (Table III). Although there were no significant difference in overall mortality rate by sex, the risk of death among boys was significantly higher during infancy and later childhood (10–12 years) thang among girls except between 1–9 years of age where, the reverse trend was observed. In comparison to the opposite sex the relative risk of death for boys was 1.15 times higher during infancy and over 10 years and 3 times lower between 1 to 9 years. The rates of infant and perinatal mortality at Benghazi have earlier been reported to be higher for males as also reported in most countries of the world except Czechoslovakia, Afghanistan, India and Nepal [1, 2, 3, 4, 9, 11]. In fact, over the last 30 years there was a rising trend in the male sex mortality rates over the female in all age groups; the increase, however, was not uniform. The lower mortality rates for females during infancy showed their constitutional superiority, high rates during 1–9 years indicated a possible inadequacy of care or attention due to male sex preference and the decrease after 10 years might be due to the victory over adverse social conditions and the influence of pubertal hormones.

Child loss in Libya has been observed to be 1.6 per every married woman and 1.2 per woman in the reproductive age group, a substantial loss to the mothers, families and the country [3].

Leading causes of childhood mortality

Out of 595 deaths, 141 (23.7%) were due to prematurity, 85 (14.4%) to diarrhoeal diseases (mostly gastroenteritis), 65 (10.9%) to respiratory infections (mostly pneumonia), 71 (11.9%) to septicaemia, 66 (11.1%) to congenital malformations, 44 (7.4%) to nervous system diseases (mostly meningitis), 30 (5.0%) to birth trauma, birth anoxia or hypoxia, 18 (3.0%) to malnutrition and anaemia, 27 (4.5%) to ill-defined conditions, and 13–15 (2.5%) each to haemolytic disease of the newborn and other specified diseases (Table V). A small number of deaths occurred due to renal disease

TABLE V

Causes of death in different age groups, 1980

Medical causes or disease condition	Neonate (0—27 days)		Postneonate (28 - 365 days)		Infant (0—365 days)		Under five (0—4 years)		0 - 9 years	12 years or less	
	No.	per cent	No.	per cent	No.	per cent	No.	per cent	No.	No.	per cent
Prematurity (unspecified)	125	40.6	15	6.5	140	25.9	141	24.4	141	141	23.7
Diarrhoeal diseases	9	2.9	74	32.0	83	15.4	85	14.7	86	86	14.4
Septicaemia	28	9.1	32	13.8	60	11.1	70	12.1	70	71	11.9
Acute respiratory disease	21	6.8	36	15.6	57	10.6	64	11.1	64	65	10.9
Congenital malformations	37	12.0	22	9.5	59	10.9	63	10.9	65	66	11.1
Diseases of nervous system	19	6.2	18	7.8	37	6.8	39	6.6	42	44	7.4
Birth trauma and birth anoxia	28	9.1	2	0.8	30	5.6	30	5.2	30	30	5.0
Ill-defined conditions	20	6.5	6	2.6	30	4.8	27	4.7	27	27	4.5
Malnutrition, anaemia, rickets, etc.	1	0.3	12	5.2	13	2.4	17	2.9	18	18	3.0
Haemolytic disease of newborn	11	3.6	2	0.8	13	2.4	13	2.3	13	13	2.2
Diseases of urinary system	1	0.3	5	2.2	6	1.1	9	1.6	10	10	1.7
Infectious hepatitis	0	—	3	1.3	3	0.6	5	0.8	5	5	0.8
Leukaemia and lymphoma	—	—	1	0.4	1	0.2	1	0.2	2	4	0.6
Other diseases	8	2.6	3	1.3	11	2.0	13	2.3	14	15	2.52
Total	308	100.0	231	100.0	539	100.0	577	100.0	587	595	100.0

TABLE VI

The cause and age specific mortality rate (case fatality rate per 100 cases) in 1980

Conditions	Total cases discharged, or dead			Dead			Case fatality rate		
	Under 1 year	1—12 years	Total	Under 1 year	1—12 years	Total	Under 1 year	1—12 years	Total
Respiratory diseases	847	573	1 420	57	8	65	6.72	1.39	4.57
Diarrhoeal diseases	986	203	1 189	83	3	86	8.41	1.47	7.23
Ill-defined conditions	293	341	634	26	1	27	8.87	0.41	4.25
Dieases of nervous system	141	132	273	37	7	44	26.24	5.30	16.11
Disease of urinary system	34	134	168	6	4	10	17.64	2.49	5.95
Acute poisoning	19	133	152	—	1	1	—	0.75	0.65
Other diseases (specified)	20	115	135	11	2	13	55.00	1.73	9.62
Prematurity (unspecified)	253	1	254	140	1	141	55.33	—	55.51
Haemolytic disease of newborn	126	—	126	13	—	13	11.50	—	11.50
Congenital anomalies	97	61	158	59	7	66	60.82	11.4	41.77
Malnutrition anaemia	13	82	95	13	6	18	100.00	7.31	18.94
Rheumatic fever/rheumatic heart disease	19	48	67	—	1	1	—	2.08	1.49
Surgical conditions	10	46	56	—	—	—	—	—	—
Infectious diseases	3	57	60	3	2	5	100.00	3.50	8.33
Malignancy	1	40	41	1	3	4	100.00	7.50	9.75
Birth trauma/birth anoxia	68	—	68	30	—	30	44.11	—	44.11
Septicaemia	70	14	84	60	11	71	85.75	78.57	84.52
Total	2 995	1 980	4 980	539	56	595	17.99	2.82	11.95

Frequencies are based on 10% randomized sample of discharges plus total deaths.

(10 cases), infectious hepatitis (5 cases), malignancy (4 cases), and 1 each to kerosene poisoning and rheumatic heart disease. Among the discharged cases more than 80% were due to respiratory infections (1420 cases), diarrhoeal disease (1189 cases), ill-defined conditions (634 cases), diseases of the nervous system (273 cases), and of the urinary system (168 cases), and acute poisonings (152 cases). The majority of admissions was due to respiratory infections, gastroenteritis, pneumonia, septicaemia and congenital malformations.

The case fatality was 11.95% for all diseases among all age groups, 17.99% under 1 year and 2.82% for 1–12 years of age (Table VI). The risk of death from all diseases together was nearly 7 times higher among infants than those over 1 year of age. The case fatality rate was 84.5% for septicaemia, 55.5% for prematurity, 44.1% for birth trauma and birth anoxia, 41.7% for congenital malformations, 18.9% for malnutrition and anaemia, 16.1% for meningitis, and 11.5% for haemolytic disease of the newborn (Table VI). The case fatality rate for diseases like respiratory infections, diarrhoeal diseases, renal disease, malignancy, rheumatic heart disease and ill-defined conditions varied between 1.4 to 9.7%. Children with acute poisoning had a case fatality of 0.65% which was the lowest among all causes. The common agents of poisoning necessitating admission in the order of frequency were kerosene, drugs (barbiturates, salicylates) and insecticides (Flit, Baygon, etc.).

The 66 deaths due to congenital anomalies included 24 cases of congenital heart disease, 21 of unspecified congenital malformations, 7 each of multiple congenital anomalies and congenital malformations of the nervous system including 1 spina bifida, 3 of Down syndrome and one of congenital malformation of the kidney. The other specified conditions comprised hepatic failure (3 cases), mental retardation (2 cases), coagulation defect (2 cases) and one case each of scarlet fever, pneumothorax, head injury, Reye's syndrome, aplastic anaemia and 2 others.

The case fatality rate among infants for all the diseases was 2 to 30 times higher than in the older age groups (1–12 years), except for prematurity and other conditions confined to infants. The protection provided by breast feeding against infections and death in young childhood has been confirmed both for the underdeveloped and the industrialized countries [20, 21]. Hospital admissions for diarrhoeal diseases were more common in weaned infants and the case fatality was significantly higher among weaned children, particularly for measles, diarrhoeal diseases and acute lower respiratory tract infections [21]. Differences in infant and childhood mortality between developing and developed countries exist not only in the level of mortality but also in the leading causes of death [5, 6, 7, 14, 15, 16, 18, 19]. Those of our hospital and also community based studies [1, 2] showed the preponderance of prematurity, diarrhoeal dis-

TABLE VII

Leading causes of child deaths at Al-Fateh Paediatric Hospital, Benghazi in 1980, compared with developing countries and developed countries*

Age group	Infants	1–4 years
Benghazi (Al-Fateh Paediatric Hospital)	Prematurity (unspecified), diarrhoeal diseases, septicaemia, acute respiratory infections, congenital malformation, meningitis, birth injuries	Septicaemia, acute respiratory infections, congenital anomalies, malnutrition, renal diseases, infectious hepatitis, diarrhoeal diseases
Developing countries	Diarrhoeal diseases, acute respiratory infections, etc., whooping cough	Diarrhoeal diseases, acute respiratory infections, etc., measles
Developed countries	Birth injuries, congenital anomalies, influenza, pneumonia, diarrhoeal diseases	Accidents, congenital anomalies, malignant neoplasm, acute respiratory infections

* Summarized from WHO Technical Report Series No. 600, 1976.

eases, septicaemia, acute respiratory infections, congenital anomalies, meningitis and birth trauma among the leading causes of infant deaths; and septicaemia, acute respiratory infections, congenital anomalies, malnutrition and renal diseases among the 1–4 year old fatalities (Table VII). The most common causes of infant mortality were diarrhoeal diseases and acute respiratory infections in developing regions; and birth injuries, congenital anomalies and to some extent respiratory infections and diarrhoeal diseases in developed countries [12, 16, 17]. In developing countries the real frequency of congenital anomalies and birth injuries was concealed due to overshadowing by other infective and parasitic diseases. The main causes of childhood mortality in developing nations were indeed the continuation of conditions operating during infancy with addition of measles or malaria; whereas in developed countries accidents and malignancy occupy important positions in childhood mortality [5, 16, 17, 20].

CONCLUSIONS

In our hospital, during 1975 to 1980 the mortality rate varied between 52.1 (1975) to 125.5 (1978) per 1000 discharges and progressively increased by years. The higher proportion of deaths was observed from September to January though a higher proportion of admissions occurred from May to July. The highest documented mortality rate of 106.8 was for the month of December and the lowest of 68.2 was observed for the month of May. The death rates had doubled for almost all months between 1975 to 1980 which pointed to the necessity of more detailed investigations of the factors responsible for such changes. The death rates were higher for males

during infancy most probably due to the constitutional superiority of females, and higher for females during early childhood (1–9 years) possibly due to neglected care or poor attention to girls, and higher among males thereafter which could be due to the superior constitution along with the benevolent influence of pubertal hormones among girls. The mortality rates were inversely proportional to age. The mortality rate of 641.6 per 1000 discharges among neonates was reduced to 116.3 (1/4) by the post-neonatal period, 32.8 (1/20) by 1–4 years, 21.7 (1/29) by 5 to 9 years and 25.7 (1/25) by 10 to 12 years of age. The risk of death was inversely proportional to age and was observed to fall dramatically with the increase in age.

Prematurity, septicaemia, congenital anomalies, and birth trauma or birth anoxia contributed to approximately 50% of all deaths; whereas these formed only 11.3% of total admissions. A need was felt to further analyse the above mentioned four causes by refining the diagnosis and predisposing factors. The future reduction of mortality among children in homes and at the hospital in particular was obviously linked to the prevention and early efficient management of such conditions.

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