

Frequency of visits for health care by low-birth-weight and preterm Saudi infants in the first year of life

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تواتر زيارة مراكز الرعاية الصحية من قِبَل الرُّضْع السعوديين الناقصي الوزن عند الولادة والخدَّج خلال العام الأول من العمر

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الخلاصة: أُجريت دراسة استيعادية شملت جميع القطاعات في مستشفى سعودي، للمقارنة بين تواتر زيارة المستشفى من قِبَل الرُّضْع الناقصي الوزن عند الولادة ومن قِبَل الكاملي الوزن عند الولادة؛ وكذلك من قِبَل الخدَّج (المبتسرين) والمولودين لتمام مدة الحمل، وذلك في العام الأول من العمر. كما أُجري تحليلٌ متعدّد المتغيّرات لتواتر زيارة المستشفى لتلقي الرعاية الصحية، مع تحليل الوزن عند الولادة، ومدة الحمل، وحرز أبغار، وطريقة الولادة، والجنس، في 2358 رضيعاً. وبيّنت الدراسة أن عدد زيارات الرعاية الصحية كان أعلى بنسبة يُعتدُّ بها إحصائياً للرُّضْع المنخفضي الوزن عند الولادة والرُّضْع المولودين قبل تمام مدة الحمل. ورغم أن طريقة الولادة لم يكن لها أي أثر على تواتر الزيارات، إلا أن الذكورة وضعف حرز أبغار بعد الولادة بخمس دقائق، قد ترافقا بزيادة الزيارات إلى العيادات التخصصية وزيادة معدلات الإدخال إلى المستشفى.

ABSTRACT A retrospective hospital-based cross-sectional survey in a Saudi Arabian hospital compared the frequency of visits to hospital of low-birth-weight and normal-birth-weight infants and of preterm and full-term infants during the first year of life. A multivariate analysis of the visits for health care with birth weight, term, Apgar score, mode of delivery and sex was made for 1892 infants. The number of visits for health care was significantly higher for low-birth-weight and preterm infants. While the mode of delivery had no effect on the frequency of visits, male sex and poor Apgar score 5 minutes after birth were associated with greater frequency of visits to specialty clinics and higher rates of hospitalization.

Fréquence des consultations de soins de santé pour les nourrissons de faible poids de naissance et les prématurés saoudiens durant la première année de vie

RÉSUMÉ Une étude transversale hospitalière réalisée rétrospectivement dans un hôpital d'Arabie saoudite a permis de comparer la fréquence des consultations à l'hôpital de nourrissons de faible poids de naissance et de poids de naissance normal et des prématurés et des enfants nés à terme durant la première année de vie. Une analyse multivariée des consultations de soins de santé comprenant le poids de naissance, le score d'Apgar, le mode d'accouchement et le sexe a été effectuée pour 1892 nourrissons. Le nombre de consultations de soins de santé était significativement plus élevé pour les nourrissons de faible poids de naissance et les prématurés. Alors que le mode d'accouchement n'avait pas d'effet sur la fréquence des consultations, le sexe masculin et un mauvais score d'Apgar à 5 minutes de vie étaient associés à une plus grande fréquence des consultations dans les services spécialisés et à des taux d'hospitalisation plus élevés.

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Introduction

There have been great improvements in perinatal medicine over the last few years. Technological advances in neonatology, better understanding of neonatal physiology and close collaboration between obstetrics and neonatology has steadily improved the survival of low-birth-weight (LBW) infants. However, these positive outcomes are accompanied by an increased burden on health care resources [1].

LBW infants are at higher risk for morbidity during their first year of life [2]. The frequency of visits for health care, other than preventive procedures such as immunizations, provides an index of morbidity in this group of children and gives a fair indication of the utilization of health care resources by them. The present study was undertaken to compare the frequency of visits for medical care by low- and normal-birth-weight infants as well as term and preterm infant during the first year of life. It was based in the Northern Area Armed Forces Hospital, which is a modern, well-equipped 330-bed hospital situated at King Khalid Military City in Saudi Arabia close to the border with Kuwait. The hospital offers comprehensive health care to about 120 000 inhabitants of the city who are mainly Saudi military personnel and their dependents. Civilian Saudi personnel and expatriate support staff form a small part of the population. Four large satellite family clinics offer primary health care to the dependents of all eligible personnel.

Methods

Approval was obtained for this survey from the Hospital Research Ethics Committee in April 2003. The sample included all live born infants born between 00.00 hours 1 January 2001 and 24.00 hours 31

December 2001. Abortions, intrauterine fetal deaths, stillbirths and neonatal deaths were excluded from the study sample. Infants who never visited the hospital or primary care clinic (as they may have moved out of the city or attended other hospitals) did not have case files and were excluded from the study.

Data was collected from the delivery room register and the case files of the infants. The delivery register yielded information on the medical record numbers of the infant and its mother, Apgar scores at 1 and 5 minutes after birth, date of birth, birth weight, expected date of delivery, mode of delivery, sex and nationality of the infant. Gestational age and the term of the infant were determined from the date of birth and expected date of delivery. Expected date of delivery was calculated from the findings of the last ultrasound scan during the antenatal period. Where this was unavailable, it was calculated from the date of the last menstrual period. Infants born after 37 complete weeks of gestation were considered full-term and the rest were categorized as preterm. Birth weight was measured in g using digital weighing scales (Cardinal Detecto model no. 6735). Based upon birth weight, the infants were sorted into 3 groups. Those weighing 1499 g and less were considered very low-birth-weight (VLBW), while those weighing 2500 g and more were considered normal-birth-weight (NBW). Infants weighing 1500 to 2499 g were considered moderately low-birth-weight (MLBW). Based upon Apgar score at 5 minutes after birth, the infants were divided into 2 groups; good Apgar score (≥ 7) and poor Apgar score (< 7).

Each infant has two case files, one at the primary care clinic and the other at the hospital. Details of visits to the primary care clinics and the emergency room were obtained from the case files at the primary

care clinics. Frequency of visits to the specialty clinics and details of admissions in the hospital were obtained from the case file of the infant maintained at the hospital. The total number of visits was calculated by adding the number of visits to the primary care clinics, emergency room and the specialty clinics. The number of hospitalizations and visits for immunization and preventive care were excluded from the total visits.

Statistical analysis

The data was entered into *Epi-Info* software version 3.2. Bivariate and multivariate analysis was performed with the number of visits and admissions and other variables including birth weight, term, Apgar score at 5 minutes and mode of delivery. Means, variance, standard deviation and median, together with 25% and 75% confidence limits were calculated for the number of visits and admissions. ANOVA, a parametric test for inequality of population means, was performed for normally distributed data. Bartlett's test for inequality of population variances was performed to calculate Bartlett's chi-squared and *P* value. A small $P < 0.05$ would suggest that variances were not homogeneous and that the ANOVA test may not be appropriate for the procedure. For such cases, Mann-Whitney/Wilcoxon 2-sample test (Kruskal-Wallis test for 2 groups) was used to calculate the *P* value for significance and to obtain Kruskal-Wallis *H*, which is equivalent to chi-squared. $P < 0.05$ was considered significant.

Results

Baseline data

A total of 2417 deliveries were conducted during the year 2001. Of these 2358 (98.0%) were live births, 45 (1.9%) were

stillbirths and 14 (0.6%) were neonatal deaths with an overall perinatal mortality of 2.4%. Of the 2358 live-born infants, 466 never attended for medical care or immunization during their first year of life and, because they had no cases files, they were excluded from the study. Of the remaining 1892 infants, 971 (51.3%) were males and 921 (48.7%) females (male to female ratio of 1.05:1). The great majority of the infants were Saudi Arabian (99.1%) nationality; Egyptian and Sudanese infants formed 0.3% and 0.2% and American, Syrian, Sri Lankan, Indian, Pakistani, Philippine, Somali and Iraqi infants were 0.4%.

The mode of delivery was mainly spontaneous vaginal delivery (85.3%), with elective or emergency caesarean section (10.1%), forceps-assisted (2.4%) and ventouse-assisted (2.2%) deliveries accounting for the rest. Of the vaginal deliveries, 2.1% were breech presentations. The incidence of multiple births was 35 among the live births (18.5 per 1000 live births). All of these were twins.

The birth weight of the study sample ranged from 685 g to 5645 g, with a mean of 3111 g (standard deviation 524 g). Boys were heavier than girls (mean birth weight of 3165 g versus 3053 g).

There were a total of 191 LBW infants, giving an incidence of LBW among the study population of 101 per 1000 live births. There were a total of 14 VLBW infants (7 per 1000 live births) and their mean birth weight was 1198 g (SD 252 g), range 685–1490 g. There were 177 (94 per 1000 live births) MLBW infants, with a mean birth weight of 2239 g (SD 232 g), range 1540–2495 g. The remaining 1701 NBW infants (899 per 1000 live births) had a mean birth weight of 3217 g (SD 424 g), range 2500–5645 g.

The mean gestational age of the sample was 39.5 weeks (SD 1.7). There were 78 preterm infants, an incidence of 41 preterm

deliveries per 1000 live births. Of the 14 VLBW infants, 13 (92.9%) were preterm, while 43 (24.3%) of 177 MLBW infants were preterm. Among 1701 NBW infants, 22 (1.3%) were preterm. The mean birth weight of preterm infants was 2171 g (SD 671 g) while full-term infants had a mean birth weight of 3151 g (SD 477g).

Based on Apgar score at 5 minutes after birth, there were 1868 (98.7%) infants with scores of ≥ 7 (good) and 24 (1.3%) infants with scores of < 7 (poor).

Visits

Of the 1892 infants, 144 (7.6%) attended for immunization only and 1748 (92.4%) infants sought medical care at the hospital, emergency room or their primary care clinics. A total of 268 infants (14.2%) were hospitalized for various reasons during this period (Table 1). The number of admissions for each of these infants varied from 1 to 5, with a mean of 1.2 admissions. The total visits for the infants varied from 1 to a maximum of 67 with a mean of 6.7 visits. However, only 1483 (78.4%) infants attended for immunization. The number of contacts for immunization among these infants varied from a minimum of 1 to a maximum of 8 visits with a mean of 3.5 visits.

Sex

Overall, male infants presented for medical care more often than females (Table 1). Rates of hospitalization, visits to specialty clinics and emergency room and total visits were significantly higher among males. Female infants had a slightly higher number of visits for immunization and lower number of visits to the primary care clinics, but the difference was not statistically significant.

Term

Overall, preterm infants made more frequent visits than full-term infants (Table 1).

They had significantly higher rates of hospitalization, total visits, visits to the emergency room and specialty clinics. Immunization visits and visits to the primary care clinics were both marginally higher for term infants, but the difference was not statistically significant.

Birth weight

There was a statistically significant difference in the number of admissions, total visits, visits to the emergency room and specialty clinics by the 3 groups of infants categorized by birth weight (Table 1). However, there was no statistically significant difference in their visits to primary care clinics and for immunization. VLBW infants had the highest number of admissions, total visits, visits to the emergency room, primary care clinics, specialty clinics and for immunization. Among the 2 other categories of infants, MLBW infants had higher rates of admission, total visits, visits to the emergency room and specialty clinics than NBW infants; visits to primary care clinics and for immunization were marginally higher among NBW infants.

Birth weight and term

Bivariate analysis of the frequency of visits with the birth weight and term of the infants revealed a significantly higher number of visits to specialty clinics and number of hospitalizations for the 2 LBW categories among full-term infants (Table 2). There was no significant difference between the birth weight categories of full-term infants for visits to the emergency room, primary care clinics, total visits and visits for immunization. Among preterm infants, however, total visits, hospitalizations and visits to the emergency room and specialty clinics were all highest for the VLBW infants and lowest for the NBW infants. The difference was statistically significant. Though visits to pri-

Table 1 Frequency of visits and hospitalization during the first year of life for 1892 live-born infants

Variable	No. of infants	Admissions		Total visits		Visits to specialty clinics		Visits to emergency room		Visits to primary care clinics		Visits for immunization	
		Mean (SD)	P-value ^a	Mean (SD)	P-value ^a	Mean (SD)	P-value ^a	Mean (SD)	P-value ^a	Mean (SD)	P-value ^a	Mean (SD)	P-value ^a
Sex													
Male	971	0.20 (0.51)		6.59 (6.76)		1.48 (2.62)		0.51 (1.53)		4.59 (5.10)		2.63 (1.99)	
Female	921	0.14 (0.42)		5.79 (5.92)		0.91 (2.07)		0.36 (0.79)		4.52 (5.04)		2.81 (1.87)	
<i>P</i> -value ^a		0.004		0.02		0.00		0.02		0.74		0.04	
Term													
Preterm	78	0.72 (0.74)		8.15 (8.84)		3.13 (4.82)		0.95 (2.04)		4.10 (4.79)		2.29 (1.99)	
Full-term	1814	0.15 (0.44)		6.11 (6.24)		1.12 (2.19)		0.42 (1.18)		4.57 (5.08)		2.74 (1.93)	
<i>P</i> -value ^a		0.00		0.055		0.00		0.02		0.20		0.57	
Birth weight													
VLBW	14	1.36 (0.74)		15.21 (15.01)		7.50 (8.95)		2.86 (3.69)		5.00 (4.82)		2.50 (1.91)	
MLBW	177	0.42 (0.66)		6.45 (6.42)		1.99 (3.35)		0.48 (0.89)		3.97 (4.64)		2.24 (1.98)	
NBW	1701	0.13 (0.42)		6.09 (6.21)		1.07 (2.04)		0.42 (1.21)		4.61 (5.11)		2.77 (1.92)	
<i>P</i> -value ^a		0.00		0.036		0.00		0.001		0.23		0.003	
Mode of delivery													
Spontaneous vaginal	1614	0.15 (0.43)		6.2 (6.37)		1.16 (2.32)		0.43 (1.22)		4.61 (5.14)		2.72 (1.93)	
Caesarean section	192	0.28 (0.64)		6.35 (6.73)		1.57 (3.09)		0.53 (1.38)		4.25 (4.66)		2.73 (1.92)	
Forceps-assisted	45	0.27 (0.62)		6.16 (6.42)		1.04 (1.58)		0.64 (1.29)		4.47 (5.02)		2.93 (1.98)	
Ventouse-assisted	41	0.32 (0.52)		5.41 (4.99)		1.39 (1.91)		0.22 (0.47)		3.80 (4.31)		2.32 (2.13)	
<i>P</i> -value ^a		0.0003		0.94		0.19		0.56		0.52		0.5	
Multiple births													
Twin	35	0.26 (0.66)		6.03 (7.71)		1.31 (2.34)		0.66 (1.53)		4.11 (5.14)		2.26 (1.72)	
Singleton	1857	0.17 (0.46)		6.20 (6.35)		1.20 (2.39)		0.44 (1.23)		4.56 (5.07)		2.73 (1.94)	
<i>P</i> -value ^a		0.56		0.16		0.85		0.88		0.27		0.15	

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Table 1 Frequency of visits and hospitalization during the first year of life for 1892 live-born infants (concluded)

Variable	No. of infants	Admissions		Total visits		Visits to specialty clinics		Visits to emergency room		Visits to primary care clinics		Visits for immunization	
		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
Apgar score at 5 min													
Good (≥ 7)	1851	0.16 (0.45)		6.18 (6.28)		1.17 (2.25)		0.44 (1.22)		3.66 (4.9)		2.18 (2.04)	
Poor (< 7)	41	0.78 (0.69)		7.07 (9.75)		2.90 (5.68)		0.61 (1.77)		3.32 (4.22)		1.84 (2.02)	
P-value ^a		0.00		0.79		0.068		0.59		0.71		0.31	

^aKruskal-Wallis test.

SD = standard deviation

VLBW = very low-birth-weight; MLBW = moderate low-birth-weight; NBW = normal-birth-weight.

mary care clinics and for immunization were the highest among preterm VLBW infants, the difference among the birth-weight categories was not statistically significant.

Mode of delivery

There was a significant difference in the admission rates of infants born by different modes of delivery (Table 1). Those born by spontaneous vaginal delivery had a mean of 0.15 admissions while those born by caesarean section, forceps- or ventouse-assisted delivery, had a mean of 0.27 to 0.32 admissions during the period ($P = 0.0003$). However, mode of delivery did not significantly affect the frequency of total visits, visits to the emergency room, primary care clinic and specialty clinics and visits for immunization.

Multiple gestation

Twins made a higher number of visits and hospitalizations than singletons, except for immunization visits that were higher in the latter group (Table 1). However, the differences were not statistically significant.

Apgar score

Rates of admission and visits to specialty clinics were significantly higher among infants scoring poorly on Apgar score at 5 minutes after birth ($P = 0.00$ and 0.01 respectively) (Table 1). Although infants with a poor Apgar score paid more total visits and visits to the emergency room, the difference was not statistically significant. Similarly, there was a slightly lower rate of visits to primary care clinics and for immunization by those with poor Apgar scores, but again the difference was not statistically significant.

Admissions

Considered overall, 268 infants had at least 1 admission during the first year of life: 223

Table 2 Frequency of hospital visits during the first year of life comparing birth weight categories and term for 1892 live-born infants

Birth weight and term	No. of infants	Admissions		Total visits		Visits to specialty clinics		Visits to emergency room		Visits to primary care clinics		Visits for immunization	
		Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)		
VLBW													
Preterm	13	1.46 (0.66)	16.15 (15.19)	7.85 (9.22)	3.08 (3.75)	5.38 (4.79)	2.69 (1.84)						
Full-term	1	0	3.00 (0.00)	3.00 (0.00)	0	0	0						
MLBW													
Preterm	43	0.74 (0.69)	6.49 (4.45)	2.84 (2.79)	0.53 (0.85)	3.12 (3.58)	2.14 (2.04)						
Full-term	134	0.32 (0.62)	6.43 (6.94)	1.72 (3.47)	0.46 (0.89)	4.25 (4.91)	2.28 (1.97)						
NBW													
Preterm	22	0.23 (0.43)	6.68 (8.23)	0.91 (1.41)	0.50 (1.53)	5.27 (6.40)	2.36 (2.04)						
Full-term	1679	0.13 (0.42)	6.09 (6.18)	1.07 (2.04)	0.42 (1.20)	4.60 (5.09)	2.77 (1.92)						
P values^a													
Preterm	78	0.00	0.045	0.002	0.007	0.28	0.71						
Full-term	1814	0.00	0.94	0.023	0.77	0.25	0.007						

^aKruskal-Wallis test.

SD = standard deviation.

VLBW = very low-birth-weight; MLBW = moderate low-birth-weight; NBW = normal-birth-weight.

had 1 admission, 36 had 2 admissions, and 7 had 3 admissions, 1 had 4 admissions and 1 had 5 admissions. Medical reasons constituted over half the indications for admission. Respiratory, neurological and infectious diseases formed the bulk of medical indications for hospitalization, with gastrointestinal, haematological and metabolic conditions contributing a smaller portion (Table 3).

Certain conditions unique to the neonate such as intrauterine growth retardation, neonatal jaundice, neonatal thrombocytopaenia, birth asphyxia and meconium aspiration, in addition to prematurity and low birth weight *per se*, formed more than one-

fifth of the indications while congenital abnormalities contributed to over 8% of the indications for hospitalization.

Overall, surgical conditions were indications for 1 in 10 admissions. Conditions requiring corrective surgery such as inguinal hernias and congenital deformities were indications in 4.9% of the hospitalizations. Trauma and poisoning were indications for a little over 3% of the admissions.

Maternal risk factors such as eclampsia, pregnancy-induced hypertension or intrapartum seizures formed a small percentage of the reasons for admission of the newborn together with its mother.

Table 3 Indications for hospital admission during the first year of life comparing birth weight categories and term for 1892 live-born infants.

Indication	Overall	Term		Birth weight categories		
	% (n = 268)	Preterm % (n = 44)	Full-Term % (n = 244)	VLBW % (n = 13)	MLBW % (n = 60)	NBW % (n = 195)
<i>Medical</i>						
Respiratory	23.4	23.2	23.4	36.9	18.7	23.8
Neurological	8.9	0	10.8	0	4.0	11.3
Infectious diseases	7.1	7.1	7.1	15.8	4.0	7.4
Gastrointestinal	5.2	1.8	6.0	5.3	1.3	6.5
Haematological	4.0	1.8	4.5	0	2.7	4.8
Metabolic	3.7	0	4.5	0	5.3	3.5
Cardiovascular	2.2	1.8	2.2	0	5.3	1.3
Excretory	0.9	0	1.1	0	0	1.3
Endocrine	0.3	0	0.4	0	0	0.4
<i>Paediatric</i>						
Neonatal conditions	22.5	44.6	17.8	31.6	45.3	14.3
Congenital abnormalities	8.9	8.9	8.9	5.3	8.0	9.5
<i>Surgical</i>						
Operative surgery	4.9	1.8	5.6	0	1.3	6.5
Trauma	3.1	1.8	3.3	0	1.3	3.9
Other surgical conditions	1.2	1.8	1.1	5.3	0	1.3
<i>Maternal</i>						
Maternal causes	3.7	5.4	3.3	0	2.7	4.3

VLBW = very low-birth-weight; MLBW = moderate low-birth-weight; NBW = normal-birth-weight.

Among the VLBW infants, respiratory conditions and neonatal conditions were indications in one-third each of the hospitalizations. However, respiratory causes accounted for less than one-fifth of the admissions among MLBW infants. The predominant cause for admission in this group was for neonatal conditions such as prematurity, LBW, neonatal jaundice and birth asphyxia. Among the NBW infants, the indications for admission were more varied. About a quarter of the admissions were for respiratory causes. Neonatal conditions and neurological causes were the next most common causes for admission in this group. Congenital deformities, infectious diseases, gastrointestinal conditions such as gastroenteritis and haematological conditions such as sickle cell crises constituted the rest.

Among the preterm infants, neonatal conditions such as birth asphyxia, meconium aspiration and neonatal jaundice formed a little less than half the indications for admission, while respiratory causes were indications in about a quarter of the hospitalizations. However, the indications were less disparate among the full-term infants. About a quarter of the admissions for these infants were for respiratory causes, while neonatal conditions were indications in over 17% of the admissions. Other common causes included neurological conditions and congenital deformities.

Discussion

Frequency of visits to the hospital is a reflection of the utilization of health care resources. Studies over the past 3 decades have established that preterm birth and LBW can result in substantial costs to the health sector following the infant's initial discharge from the hospital [3]. Information on the pattern of the utilization of health

care services is needed by several groups: by parents so that they can understand the possible consequences of caring for LBW and preterm infants; by paediatricians and obstetricians to enable them to evaluate their services and for research purposes; by health administrators so that they can make informed decisions and plan for improvements where needed; and by the general public so that they can take part in an informed debate on priorities in health care [1].

The baseline data of the present study generally conforms to published studies in Saudi Arabia. Al Eissa et al. [4], in their multicentre prospective study in Riyadh, calculated an incidence of LBW of 7.4% among live born infants. Dawodu et al. [5] found the incidence of LBW was 7.1% and VLBW was 0.38% in a cohort of infants born at King Fahad Hospital at Al Khobar. Khalid et al. [6] found an incidence of 13.6% LBW in a cohort of infants they studied at Taif. The mean birth weight of the infants was 3044 g. Male infants were marginally heavier than the female infants. Al Faraidy et al. [7] conducted a nationwide survey of perinatal mortality in Saudi Arabia in 1993. In their sample, they found a mean birth weight of 3.15 kg with an incidence of LBW of 8.2% and 8.6% of preterm births. Though the mean birth weight and incidence of LBW is comparable in the present study, the incidence of preterm births is considerably lower at 3.7%.

Though there is no dearth of studies on the utilization of medical care by infants in the first year of life in medical literature, no study has so far been conducted in Saudi Arabia. A MEDLINE search returned only 2 studies of relevance, a study conducted by Siddiqui and Ogbeide [8] in Al Kharj and another by Al Ayed et al. [9] at Riyadh. However, these studies were confined to

visits to the emergency room and covered an age group of children beyond infancy.

Several studies have found that LBW infants tend to use health care services more often than non-LBW infants. Jackson et al. [2] in their study in Sweden found that VLBW infants made a greater number of visits for health care in the first year of life than NBW infants. Stevenson et al. [10] studied a cohort of children born with LBW in a geographically defined population at Merseyside in the UK and followed them up prospectively. They found that LBW infants continued to use hospital and family practitioner services more intensively than did control infants up to the age of 9 years. Similarly, Mutch et al. [11] found that the admission rates of VLBW infants were considerably higher than NBW infants. This is borne out in the present study. LBW is consistently associated with greater frequency of visits for health care.

Studies have consistently found that the need for medical services is substantially greater for preterm infants than full-term infants. Elder et al. [12] found that male sex, lower gestation and lighter weight at birth were risk factors for higher rates of admission during the first year of life. Similarly, Leijon et al. [13] found that preterm children were more often admitted to hospital and had more outpatient attendances during their first year of life. Blondel et al. [14] in their study on the use of medical services by preterm children during the first year of life in the Epipage cohort found that the total number of visits and contacts with the specialists were more frequent for preterm infants than full-term infants. On the other hand, Westcott et al. [15] did not find a statistically significant difference in the utilization of primary care services by term and preterm infants, though the number of admissions were higher for preterm infants. Paneth et al. [16] conducted a study on a

large cohort of infants born in New York city maternity services. They found that lower gestational age at birth was significantly associated with higher morbidity in early infancy. Preterm infants have higher rates of neurological disabilities, grow poorly and have higher rates of other health problems including poorer respiratory health in early childhood [17]. The present study has revealed a similar trend. Preterm infants were found to visit for health care more often than full-term infants.

Male infants made more frequent visits than the females. The difference in the number of visits by the males and females was statistically significant for total visits, number of hospitalizations and visits to the emergency room and specialty clinics. The number of visits to primary care clinics was higher for male infants and the number of visits for immunization was higher for female infants. The difference, however, was not significant.

Krantz and Hjalmarson [18] in their study of utilization of health care services during the first year of life found that infants born after elective caesarean section had longer stays at the hospital than those delivered by vaginal delivery, but the number of admissions was not affected significantly by the mode of delivery. In the present study, though the number of visits for health care was higher for infants born by assisted delivery and caesarean section than those infants born by spontaneous vaginal delivery, the difference was not statistically significant.

Low Apgar scores at 5 minutes generally reflect the need for resuscitation in the newborn infant. The effect of Apgar score on the health status during infancy and early childhood is controversial. Campbell et al. [19] and Nelson et al. [20] have identified Apgar score at birth as a predictor of motor development in both LBW and NBW in-

fants. The present study revealed a significant difference in the number of visits to specialists' clinics at the hospital and the number of admissions between infants having a good score and those with a poor Apgar score at 5 minutes after birth.

Respiratory tract disorders were a major reason for hospitalization among the infants of all groups of birth weight and term. Conditions unique to the neonate such as meconium aspiration, birth asphyxia, neonatal jaundice and neonatal thrombocytopaenia accounted for the majority of admissions among the MLBW infants. Indications for admission among the NBW infants were more varied, though respiratory disorders formed the largest group. Among VLBW infants, respiratory and infectious causes were indications for admission among more than two-thirds of the infants.

Among preterm infants, neonatal conditions including prematurity itself and LBW were the most common indications for admission, followed by respiratory causes. However, indications for admission were more evenly balanced among the full-term infants, with respiratory causes being the most common indication closely followed by neonatal conditions.

Langkamp et al. [21] in their study on a nationally representative sample of infants born in 1988 in the United States found that LBW infants were at risk for immunization delays compared with NBW infants. They found that LBW infants received their first 3 vaccinations significantly later and they were significantly less likely to be up to date for all immunizations at age 12 months. In our study, preterm infants had lesser number of visits for immunization than full term infants. NBW infants had greater number of contacts for immunization than MLBW infants but lesser than VLBW infants. The differences, however, were not statistically significant. Though the females and infants

with good Apgar scores at 5 minutes visited more often for immunization, the difference between the sexes and Apgar categories was not statistically significant. Mode of delivery and multiple births had no effect on the number of visits for immunization.

There are some limitations to the present study: though only one hospital caters to all the residents of the city, some soldiers and their dependants registered at the hospital reside outside the city at nearby towns due to lack of accommodation in the city premises. Though these patients form only a fraction of the study population, the frequency of visits for this group of infants is likely to be an underestimate since they are likely to attend at hospitals outside the city both for medical care and immunization. This is the likely reason for the low percentage of immunization coverage shown in this study. Every summer, a great majority of soldiers' families leave the city for the summer vacation. This is another factor leading to an underestimation of visits and hospitalizations in this study.

The calculation of expected date of delivery was based upon the date of the last menstrual period in a few mothers lacking ultrasound confirmation of gestational age of the infant. The inaccuracy of this method of calculation of gestational age is likely to reflect on the incidence of prematurity among the infants in this sample.

Conclusions

LBW and preterm infants use health care services more often than non-LBW and full-term infants. Higher incidence of debilitating conditions and greater susceptibility to neonatal precipitants could be possible reasons for this higher incidence. Birth weight, gestational age at birth and sex of the baby significantly affected the frequency of visits for health care. While Apgar

scores at 5 minutes after birth were found to affect the frequency of visits to the specialty clinics and the number of hospitalizations, the mode of delivery of the baby and the multiplicity of births was not found to affect the use of health resources during the first year of life.

With improvements in neonatal care and obstetric services in Saudi Arabia, a greater

number of LBW and preterm infants are likely to survive into childhood. The increased survival of these infants has important implications for health resource allocation. Health service administrators need to keep this in view while planning for neonatal services in this country.

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Technical updates of the guidelines on the IMCI: Evidence and recommendations for further adaptations

Since the IMCI guidelines were first introduced, new evidence has become available from research, including studies coordinated by the Department of Child and Adolescent Health and Development (CAH/HQ), which has led to new IMCI recommendations. The updates concern the following topics:

1. Antibiotic treatment of severe and non-severe pneumonia;
2. Management of diarrhoeal diseases;
3. Antimalarials for treatment of malaria;
4. Treatment of ear infections;
5. Infant feeding;
6. Management of helminth infestations in children below 24 months.

Of relevance to public health programme managers in countries already implementing IMCI is the process to introduce the proposed recommendations in the existing guidelines, which requires reaching a consensus, a change in policies, the adaptation of guidelines and training materials, orientations or refresher training courses for health personnel already trained in IMCI, and involvement of professional and academic institutions and key partners. Further information can be found at: http://www.emro.who.int/cah/news-IMCIGuidelines_Updates.htm