Major congenital anomalies in livebirths in Alor Setar General Hospital during a three-year period.

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Summary

Out of 19769 livebirths in the Alor Setar General Hospital, Alor Setar, 302 were found to have major congenital anomalies during a 3-year period (1984-1987). This gives a prevalence rate of 1.53 per cent. The musculoskeletal system was most frequently affected, followed by the orogastro-intestinal, cardiovascular and central nervous systems. The prevalence rate of neural tube defects, clubfoot, cleft lip and/or cleft palate and congenital heart disease was greater than 1 per 1000 livebirths. The prevalence rate of anencephaly was 1.29 per 1000 total births. The frequency of occurrence of Down's syndrome was 1 in 760 livebirths. Approximately one-quarter of those with major anomalies died in the hospital before discharge.

Introduction

In Peninsular Malaysia, congenital anomalies accounted for 13% of deaths under the age of 1 year in 1984.[1] With improvement in the standards of obstetric and neonatal care services, deaths due to prematurity, perinatal asphyxia and neonatal sepsis will be reduced and congenital anomalies will become an important cause of infant mortality and morbidity in Malaysia. However, scanty information is available on this problem in Malaysia. It seemed of interest to acquire some information on the prevalence and the spectrum of congenital anomalies in the Malaysian population.

Only two previous published studies on this problem in the Malaysian population have been traceable. The first study was that coordinated by the WHO in Geneva in 1966, involving a study

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of consecutive births in 24 centres around the world.[2] Malaysia was one of the participating countries, data being collected from the Maternity Hospital in Kuala Lumpur. The other study was carried out by Sengupta and Sinnathuray[3] in 1972 at the University Hospital, Petaling Jaya. The main emphasis of the latter study was on perinatal and infant mortality, with some mention on congenital malformation rates. According to Sengupta and Sinnathuray, 27% of perinatal and infant loss were due to inborn defects or malformations.

This study was carried out in the Alor Setar General Hospital in the State of Kedah. The State of Kedah has a very different population from the two previously studied Malaysian populations, both of which were in or near the Malaysian Capital City of Kuala Lumpur. Alor Setar General Hospital serves as a referral centre for the State of Kedah, which has a predominant Malay population and also a predominant rural population, in contrast to Kuala Lumpur, which has a high proportion of Chinese and urban dwellers.

Materials and Method

In this study, major congenital anomalies in livebirths were considered. Anomalies in stillbirths were not included, except for anencephaly. Major anomalies were defined as anomalies causing cosmetic or functional disability requiring surgical or medical treatment. Minor anomalies (e.g. pigmented naevi, skin tags, naevus flammeus, simian crease, hooded penis, retracted prepuce, chordee, dermal sinus, accessory nipple, hydrocele) were not considered. Anomalies like undescended testes, inguinal hernia, tongue-tie and natal tooth were also not considered.

All livebirths occurring in the Alor Setar General Hospital from 1st. April 1984 to 31st. March 1987 were clinically examined within the first 24 to 48 hours of life. Live newborns found to have congenital anomalies were referred to one of the paediatricians for verification. When indicated, further investigations were carried out to confirm the clinical findings. These included radiological, cardiological and neurological investigations. Laboratory investigations and ultrasound examinations were also performed when indicated.

Results

A total of 20203 births were recorded during the 3-year period. There were 19769 livebirths and 434 stillbirths, constituting 97.85 per cent and 2.15 per cent of total births respectively. Table I shows certain characteristics of the study population of livebirths. Table II gives some prevalence rates. There were a total of 302 livebirths with major congenital anomalies giving a prevalence rate of 15.28 per 1000 livebirths. The prevalence rate of major anomalies were significantly higher in low birthweight infants as compared to infants of birthweight 2500g or more and in males as compared to females (chi-square test analysis; $p < 0.01$ and $p < 0.02$ respectively).

The distribution of congenital anomalies according to systems is shown in Table III. The most a common system affected was the musculoskeletal system; this accounted for slightly less than a quarter of the livebirths with anomalies. The orogastrointestinal, cardiovascular and central nervous systems accounted for about 10 per cent each. Livebirths with multiple anomalies (affecting 2 or more systems) also accounted for about 10 per cent.

Table IV shows the frequency of occurrence of the various congenital anomalies. Congenital anomalies with a frequency of greater than 1 per 1000 livebirths included clubfoot, cleft lip and/or cleft palate, Down's syndrome and congenital heart disease. Neural tube defects (anencephaly, spina bifida cystica with or without hydrocephalus, encephalocele) had a frequency of occurrence of 1.21 per 1000 livebirths. This included 2 livebirths with multiple system anomalies. There were a total of 11 anencephalic stillbirths recorded over the 3-year period. There were a total of 15

liveborn anencephalics of whom one had anencephaly associated with encephalocele and cleft lip and palate (considered as multiple anomaly). Hence, there were a total of 26 anencephalics in 20203 births (1.29 per 1000 total births).

Twenty-seven livebirths had multiple congenital anomalies (affecting 2 or more systems). Table V shows the principal systems affected and the concomitant anomalies in other systems. The systems frequently involved were the orogastrointestinal, musculoskeletal, central nervous and cardiovascular systems. Dysmorphic facies was also a frequent concomitant anomaly. Two rare major anomalies which are of interest were hydranencephaly (Fig. 1) and diphallus (Fig. 2). Seventy-one out of the 302 liveborns with major anomalies died before discharge from hospital. This represents 23.51 per cent of the liveborns with major anomalies (Table VI).

Table I

Certain characteristics of livebirths, Alor Setar General Hospital, April 1984 to March 1987.

Characteristic	Number of livebirths	Per cent of total livebirths	Ethnic Group			
			Malay	Chinese	Indian*	Others**
Total***	19769	100.00	14572	3746	958	493
Singletons	19236	97.30	14121	3695	936	484
Twins	522	2.64	446	51	16	9
Triplets	11	0.06	5	0	6	0
Birthweight<2500g	2537	12.83	1938	328	195	76
Birthweight>2500g	17232	87.17	12634	3418	763	417
Males	10139	51.29	7488	1902	495	254
Females	9627	48.70	7081	1844	463	239
Indeterminate sex	3	0.01	3	0	0	0

* Includes Indians and Pakistanis.
** Consists mainly of Siamese.
*** All figures in each section add up to the total at the start of the table.

Table II

Prevalence rates of major congenital anomalies, livebirths, Alor Setar General Hospital, April 1984 to March 1987.

Characteristics	Number of livebirths	Number with congenital anomalies	Rate of congenital anomalies
Total livebirths*	19769	302	15.28 per 1000 livebirths
Livebirths of birthweight less than 2500g	2537	75	29.56 per 1000 livebirths of birthweight less than 2500g**
Livebirths of birthweight 2500g or more	17232	224	13.00 per 1000 livebirths of birthweight 2500g or more
Liveborn males	10139	175	17.26 per 1000 liveborn males***
Liveborn females	9627	124	12.88 per 1000 liveborn females
Livebirths of indeterminate sex	3	3	100 per cent

* All figures in each section add up to the total at the start of the table.

** Significantly different from the rate in livebirths of birthweight 2500g or more

$\chi^2_c = 39.6$ d f = 1 $P < 0.01$

*** Significantly different from the rate in liveborn females

$\chi^2_c = 6.1$ d f = 1 $0.02 > P > 0.01$

Table III

Distribution, according to systems, of congenital anomalies, livebirths, Alor Setar General Hospital, April 1984 to March 1987.

System	Number with congenital anomalies	Per cent of total with congenital anomalies	Prevalence rate (per 1000 livebirths) anomalies
Musceloskeletal	72	23.84	3.64
Orogastrointestinal	39	12.91	1.97
Cardiovascular*	36	11.92	1.82
Central nervous	34	11.26	1.72
Chromosomal anomalies	33	10.93	1.67
Multiple**	27	8.94	1.36
Skin	21	6.95	1.06
Genitourinary	13	4.31	0.66
Respiratory***	6	1.99	0.30
Miscellaneous	21	6.95	1.06
Overall	**302**	**100**	**15.28**

* Excludes 6 cases of Down's syndrome, 2 cases of Edward's syndrome and 4 cases of Patau's syndrome; all of whom had associated congenital heart diseases.

** When 2 or more systems were affected.

*** Includes one case of oesophageal atresia with tracheo-oseophageal fistula.

Table IV

Frequencies of occurrence of specific congenital anomalies,livebirths, Alor Setar General Hospital, April 1984 to March 1987.

Type of anomaly	Number	Prevalence rate (per 1000 livebirths)
Musculoskeletal system		
Talipes equinovarus/valgus	25	1.26
Limb defects (constriction rings, auto-amputations, reduction deformities)	12	0.61
Polydactyly	10	0.51
Arthrogryposis multiplex congenita	7	0.35
Congenital dislocation of hip	5	0.25
Syndactyly	1	0.05
Talipes equinovarus and polydactyly	1	0.05
Polydactyly and syndactyly	1	0.05
Talipes equinovarus and limb defects	1	0.05
Achondroplasia	2	0.10
Osteogenesis imperfects	1	0.05
Hypohosphatasia	1	0.05
Short-limb dwarf	1	0.05
Pectus excavatum/carinatum	2	0.10
Poland's syndrome	1	0.05
Craniostenosis	1	0.05
Orogastrointestinal system		
Cleft lip with or without cleft palate	21	1.06
Cleft palate	4	0.20
Small bowel atresia	3	0.15
Anorectal malformations	5	0.25
Exomphalos major	2	0.10
Enteroumbilical fistula	1	0.05
Idiopathic macroglossia	1	0.05
Exomphalos major and anorectal malformations	2	0.10
Cardiovascular system		
Acyanotic congenital heart disease	24	1.21
Cyanotic congenital heart disease	11	0.56
Dexrocardia with situs inversus	1	0.05
Central nervous system		
Anencephaly	14	0.71
Congenital hydrocephalus	7	0.35
Spina bifida cystica	4	0.20
Spina bifida cystica with hydrocephalus	2	0.10
Microcephaly	3	0.15
Encephalocele	1	0.05
Hydranencephaly	1	0.05

Table IV (Cont'd)

Type of anomaly	Number	Prevalence rate (per 1000 livebirths)
Anophthalmia	1	0.05
Microsephaly and encephalocele	1	0.05
Chromosomal anomalies		
Down's syndrome	25	1.26
Edward's syndrome (Trisomy 18)	3	0.15
Patau's syndrome (Trisomy 13)	4	0.20
Turner's syndrome	1	0.05
Skin		
Strawberry/cavernous haemangioma	12	0.61
Cystic hygroma	3	0.15
Giant pigmented hairy naevus	2	0.10
Klippel-Trenaunay-Weber syndrome	1	0.05
Incontinentia pigmenti	1	0.05
Epidermolysis bullosa (simplex/dystrophica)	2	0.10
Genitourinary system		
Hypospadia	8	0.40
Potter's syndrome	2	0.10
Ambiguous genitalia	1	0.05
Diphallus	1	0.05
Imperforate vagina with hydrocolpos	1	0.05
Respiratory system		
Diaphragmatic hernia	3	0.15
Lung cyst	1	0.05
Laryngomalacia	1	0.05
Tracheo-oesophageal fistula with oesophageal atresia	1	0.05
Miscellaneous		
Ear anomalies (anotia,microtia, deformed pinna)	11	0.56
Dysmorphic facies	4	0.20
Micrognathia (severe)	1	0.05
Pierre-Robin syndrome	1	0.05
Goldenhar syndrome	1	0.05
Hemifacial microsomia	1	0.05
Sacrococcygeal teratoma	1	0.05
Choanal atresia	1	0.05
Overall	**275**	**1.39**

* Excludes 1 case of Down's syndrome associated with clubfoot.

Table V

Multi-systems congenital anomalies, livebirths, Alor Setar General Hospital, April 1984 to March 1987.

Principal system affected	Total number	Concomitant anomalies					
		CNS	CVS	GUS	MS	Skin	Dysmorphic facies
Orogastrointestinal	10	1	6	3	3	–	2
Musculoskeletal	4	–	–	1	–	–	3
Central nervous	4	–	1	–	3	–	1
Cardiovascular	4	–	–	–	–	2	2
Genitourinary	1	–	1	–	–	1	1
Chromosonal	1	–	–	–	1	–	–
Total	**24***	**1**	**8**	**4**	**7**	**3**	**9**

CNS –central nervous system
CVS – cardiovascular system
GUS – genitourinary system
MS – musculoskeletal system
* Excludes 3 cases in whom the anomalies were recorded as 'multiple congenital anomalies'.
– systems affected not recorded.

Table VI

Fate of livebirths with congenital anomalies

Fate	Sex			Total
	Male	Female	Indeterminate	
Livebirths, died in hospital	38	30	3	71
Livebirths, left hospital alive	137	94	0	231
Total	**175**	**124**	**3**	**302**

Figure 1
Photograph showing a positive transillumination test in hydranencephaly. A torchlight was 'applied' to the vertex of the head; the procedure was done in a completely dark room. In the photograph, the positive transillumination is shown in white (outlining the upper half of the head) against a black background. Part of the torchlight is shown in white too.

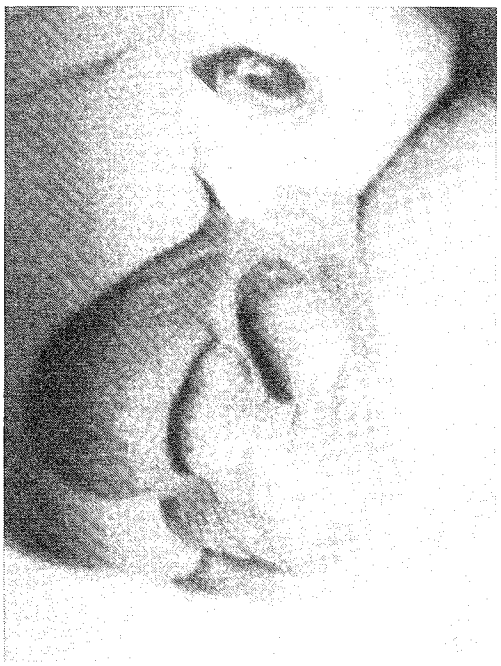

Figure 2
Photograph showing a newborn with diphallus. Note the two penile shafts and the abnormally large scrotum.

Discussion

The prevalence of major anomalies in livebirths in our series was 1.53 per cent. The prevalence of congenital anomalies is dependent on many factors. Factors that can affect the prevalence are ethnic composition, type of study population (hospital or community based, livebirths or total births, singletons or multiple births, newborns with low or normal birthweight), nature of study (prospective or retrospective), criteria of defination of congenital anomalies (major, minor or both), age at diagnosis, duration of follow-up, enthusiasm and clinical skill of the investigator; whether further diagnostic investigations are carried out (e.g. ultrasound chromosomal analysis) and the postmortem rate. Mc Intosh et al[4] has shown that only 43 per cent of congenital anomalies were diagnosed at birth; the rest were detected during the one-year follow-up. A comparison with the prevalence found in other studies is shown in Table VII. The rate varies from 0.31% to 3.7% at birth.

In this study, there was a statistically significant difference in the prevalence of major anomalies between livebirths less than 2500g and livebirths 2500g or more ($p < 0.01$) and between males and females ($p < 0.02$). The higher prevalence among low birthweight infants and among males has also been shown in many other studies. Khrouf et al[12] found a rate of congenital malformation of 4.0% among total births and a rate of 7.3% among infants less than 2500g and a rate of congenital malformation of 4.9% among males and 3.1% among females.

The musculoskeletal system was most frequently affected. It was involved in slightly less than a quarter of the cases of major anomalies. This has also been shown in other studies. Anomalies of the orogastrointestinal, cardiovascular and central nervous systems and chromosomal anomalies

Table VII

Comparative prevalence of congenital anomalies

Year	Author	Place	Prevalence of congenital anomalies	Comments
1954	Mc Intosh et al[4]	USA (New York)	3.2% at birth, 7.5% at 1 year	Detailed hospital study
1964	Marden et al[5]	USA (Wisconsin)	2.0% at birth for major defects	Hospital study
1966	Stevenson et al[2]	24 centres throughout the world	Range from 0.31% to 2.25% at birth	WHO sponsored study
1980	Siripoonya and Tejavej[6]	Thailand	2.05% among livebirths	Hospital study
1982	Singh et al[7]	Afghanistan (Kabul)	2.4% for major anomalies among livebirths	Hospital study
1982	Chinara and Singh[8]	India (Varanasi)	2.08% at birth	Hospital study
1983	Lubis et al[9]	Indonesia (Medan)	0.33% at birth	Hospital study
1983	Irawan et al[10]	Indonesia (Yogjakarta)	1.64% at birth	Hospital study
1984	Ho et al[11]	Singapore	2.47% among livebirths	Hospital study
1986	Khrouf et al[12]	Tunisia (Tunis)	3.7% among livebirths	Hospital study
1988	Goh and Yeo (Present study)	Malaysia (Alor Setar)	1.53% for major anomalies among livebirths	Hospital study

were not uncommon.

Neural tube defects had a prevalence of 1.21 per 1000 livebirths while the rate of anencephaly was 1.29 per 1000 total births in our series. The prevalence of anencephaly is approximately 1 in 1000 births[13] but remarkable variations have been reported from different areas. The highest incidence figures come from Ireland. In Belfast, 6.7 and 4.6 anencephaly births per 1000 births have been reported and in Dublin 5.0.[14] In the Negroes of Nairobi, Kenya, the incidence was 1 in 1000 births.[15] In India, Singh et al[16] reported a rate of 4.0 per 1000 total births. In Singapore, Ho[11] reported a prevalence of 0.5 per 1000 births. In France, low values of 0.2 and 0.12 per 1000 were found in Lyons.[17]

The prevalence rate of spina bifida cystica was 0.30 per 1000 livebirths. In a worldwide review, the rate was only 0.5 per 1000 births.[18] Alter,[19] summarizing hospital figures for Europe and N. America cited a variation in rates from 0.2 to 3.2 per 1000. Higher rates have been found in Europe and N. America and lower rates have been found in Asian countries (e.g. 0.2 per 1000 in Japan[14] and 0.26 per 1000 in Thailand[6]). However, in India, Singh and Sharma[16] reported a rate of 2.0 per 1000 births.

Clubfoot is one of the most frequent malformations noticeable at birth. Incidence figures from Germany and Switzerland ranged from 0.6 to 2.0 per 1000.[14] Mc Intosh et al[4] in New York City, found 5.0 per 1000 of the newborns affected. Siripoonya and Tejavej[6] found an incidence of 0.35 per 1000 livebirths in Bangkok, Thailand. The prevalence of 1.98 per 1000 births (10 cases of clubfoot associated with other anomalies were included) found in this Alor Setar series falls within the ranges established in other series. However, any comparison should be done with caution as differences may be real or due to variable methods of examination. Some authors may use the term "clubfoot" to mean talipes equinovarus alone whilst others include talipes calcaneovalgus.

The prevalence rate of polydactyly found in this series was comparable to that found in Thailand[6] and in the Caucasian population.[20] The rate was 0.76 per 1000 livebirths (includes 5 cases of polydactyly associated with other anomalies). Negroes are known to have a much higher rate of polydactyly.[20,21]

The prevalence of cleft lip and/or cleft palate was 1.82 per 1000 livebirths. This figure included 11 cases of cleft lip and/or cleft palate associated with other anomalies. Of those with cleft lip and/or cleft palate occurring singly or in combination with other anomalies, 27 were Malays, 7 were Chinese and 2 were Thais. Hence the ethnic group frequencies were 27 out of 14572 (1.85 per 1000) in Malays and 7 out of 3746 (1.87 per 1000) in Chinese. Generally, among Caucasian infants, cleft lip and/or cleft palate occurs in 0.94 per 1000 livebirths.[13] It has often been noted that frequencies were higher in Asiatic people and in particular the Japanese and Chinese.[22] The rate obtained in this study shows that the Malays also has a relatively higher frequency of occurrence of this anomaly.

The frequency of Down's syndrome was 1 in 670 livebirths (includes one case of Down's syndrome with talipes equinovarus who is classified under multiple anomalies). This is in agreement with figures obtained elsewhere. The frequencies of occurrence of Edward's syndrome (1 in 6590 livebirths) and Patau's syndrome (1 in 4942 livebirths) obtained in this study are in general agreement with the usual quoted figure of 1 in 5000 to 10000 births for Edward's syndrome or Patua's syndrome.

Where multiple anomalies were concerned, orogastrointestinal anomalies tend to occur together with cardiovascular and/or musculoskeletal anomalies and central nervous system anomalies tend to be concomitant with musculoskeletal anomalies.

Two rare major anomalies which are of interest were hydranencephaly and diphallus. Hydranencephaly is seldom reported in studies on congenital anomalies in the newborn. It is difficult to detect this anomaly at birth, especially when the head circumference is normal. However the transillumination test is very useful. This case showed a brilliant transillumination of the head and a CT head scan later confirmed the diagnosis. Diphallus is an exceedingly rare anomaly, with an incidence that has been reported to be 1 in 5.5 million births.[23]

Conclusion

The prevalence rate of major congenital anomalies was 1.53 per 1000 livebirths in the Alor Setar General Hospital. The musculoskeletal system was most frequently affected, accounting for slightly less than a quarter of the livebirths with major anomalies. Neural tube defects, clubfoot, cleft lip and/or cleft palate and congenital heart disease had a prevalence of greater than 1 per 1000 livebirths. The frequency of occurrence of anencephaly was 1.29 per 1000 total births. The frequency of occurrence of Down's syndrome was 1 in 760 livebirths. About a quarter of the livebirths with major anomalies died in the hospital before discharge.

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